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Press Cliché

An American engineer conferring with Russian executives of "Orgmetal" (Scientific Organization for the Rationalization of Production of Heavy Industry)

American Engineers in Russia

JOHN M. CARMODY
Editor, Factory and Industrial Management

Understanding the Russians is the key to success on a Soviet contract—The most brilliant technician is often the worst failure

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THE gigantic industrial program mapped out by the Russian Five-Year Plan throws an enormous burden not only on present equipment and transportation facilities, but on Russian engineering personnel as well. As a result, the government has been forced to engage foreign engineers to assist in this work. Nearly every advanced industrial country is represented, but owing to the fact that most comparisons are on the basis of what is being done in America, it is natural that a large number of these engineers should be drawn from the United States.

No two American engineers have had quite the same experience, but it is obvious that many ought not to go to Russia. They are not equipped, either technically or temperamentally, to go. Some of the men who are getting on best in Russia are not outstanding engineers. One or two so-called engineers, who are not really engineers at all, but who are darn smart fellows, good executives, good business men, get along beautifully.

They have knocked around. Other men who are among the best technical men anywhere don't get along. They either want to come out or ought to come out. As a result of our economic depression, there are many who think they would like to go to Russia. It is a nice trip —a trip to Europe, and a lot of romance about it—but it is not a bed of roses. The food isn't very good, and living conditions are radically different.

Personality Plays a Large Part

This whole Russian relationship has so many complications that it is difficult to generalize on the question: "What makes for success in Russia on the part of American engineers?" There are many instances of engineers successful at home who have not gotten on well in Russia. Personality plays a very large part there. Technical skill, too, may prove to be a greater factor for success or failure in Russia than it does at home. In the first place, in spite of their previous lack of large-scale industrial experience, Russians have an abundance of self-confidence. Their engineers, particularly those trained by the older methods, are recognized to be highly proficient technically. Most of them are well informed, particularly as to American practice. Their lack of practical experience, however, frequently makes it difficult for American engineers, and particularly practical construction men, to get on with them satisfactorily.

One element is the proclivity in Russia for long and frequent discussion of details that seem unimportant to men with practical experience on construction jobs in this country. Another is the tendency constantly to change plans after the job has been started.

The tendency toward delay which is characteristic of Russians—particularly at a time when fear of being charged with sabotage if something goes wrong, tends toward what we call buck-passing—aggravates American engineers accustomed to getting immediate action. In other words, in a country where they talk constantly about American tempo and where schedules are tightened frequently on paper, there is yet too little experience to appreciate the need for early and final decision if time is not to be wasted. This weakness was recognized by Stalin in his "New Economic Policy," recently promulgated, in which he indicated that more responsibility was to be placed on engineers.

Then, too, the relationship of the engineers to the Russian government has something to do with the matter. In some cases American firms have undertaken contracts either to design, or to design and supervise the construction of jobs, they to supply the necessary personnel. In other cases individuals have gone to work directly for the government through one of the operating trusts.

While generalization is dangerous in this instance, as in all others, it is my impression that the American engineer has a better chance for success when he is part of a competent organization than when he is merely an employee of the government. This impression was strengthened by conversations with Russian directors who pointed out that they found it more difficult to get plans changed when they were working with firms than when individual engineers were part of their engineering organizations. In view of the fact that many costly delays may be attributed directly to frequent changing of plans, the Russian government probably is better served by competent organizations than by individuals, though they would not care to admit it. But, here again, there are exceptions. Obviously no one should go there on an individual contract without knowing where he ought to sign it and what his legal rights are.

Contracts Less Favorable

So far as I could observe, the earlier contracts were more favorable to foreigners than they are now. Russia has taken note of the economic depression in other countries. The Russians are good bargainers; they seek, therefore, to get the greatest possible value for the least possible outlay. This has led them to submit contracts less favorable than the early ones. The depression likewise has led engineers from other countries to accept

Press Cliché

An American expert, acting as press foreman, discussing a detail with the production manager and the press operators, all Russians

less than they would have accepted two years ago. The combination is not particularly happy either for the Russian government or for the engineers who accept these tighter conditions, because once the man is on the job amid conditions that are totally unlike those he expected, he is likely to become a grumbler.

The new conditions may not call for a less total payment than the old, but the tendency now is to pay a larger part of the total salary in roubles and less in *valuta*. Many of the early contracts called for the payment of the total salary in the engineer's designated home bank, plus his expenses in Russia. Some of them called for 75 per cent in *valuta* and 25 per cent in roubles. More recently, contracts have been made on a 50:50 basis. Inasmuch as roubles may not be taken out of Russia, and therefore have no value outside the country, no foreign engineer really needs more than just enough roubles to pay his living expenses while in the country. His net earnings are represented by *valuta* in his home bank. Many engineers, however, hard-pressed in various of their home countries, stand ready to accept almost any sort of reasonable contract and frequently are enthusiastic at the beginning. Their enthusiasm fails when they realize that they are really working for less than they might have earned at home if they had made a serious effort.

Then, too, living conditions are entirely different from those to which most engineers are accustomed. In spite of all the building that has already been done, it is frequently difficult for these men to get satisfactory living accommodations, especially if they are accompanied by their families. Here again, there are many exceptions. Some engineers are quite as comfortably housed as they would be in America. Such is the case in Dnieperstroy and Magnetogorsk. But, even here, the lack of just ordinary recreation facilities to which these men and women have been accustomed leaves something to be desired.

The language barrier is overcome by the use of interpreters, to whose loyalty and efficiency almost every foreigner pays tribute. Few of the older men are learning to speak the language, but after a year the younger engineers both understand and speak some Russian.

Diplomacy

The greatest difficulty, of course, lies in the field of superimposing foreign practice, especially American practice, on a country which until two or three years ago had very little knowledge of modern industrial practice. The Russians want American technique more than anything else. Top officials responsible for the success of the Five-Year Plan and party leaders are so serious about this that one cannot doubt their sincerity. Down the line, however, are men who have not completely abandoned some of the fundamentals of human nature, such as a desire for personal advancement or a desire to see their plans accepted over those of strangers, especially foreigners. It is here that personality and diplomacy play so large a part. It is right here that some of the most technically proficient engineers are likely to fail, while men who are scarcely engineers at all achieve success.

Russian engineers, after all, are human. They feel they have a greater stake in their own land than outsiders can have, and, in spite of all instructions from above to make full use of American technique, they are frequently likely to slow up the process.

To me the most important phase of this relationship between foreign engineers and the Russian government is the fact that very few foreign engineers look forward to a career in Russia. First of all, few of them are in sympathy with the Russian social and economic philosophy. They are there to do a job and earn a living—in fact, to earn enough in a comparatively short time to build up a stake at home that may carry them through long emergencies. Their professional pride and their ethical training prepare them to render a more honest service to Russia than Russia is likely to credit them with being willing to give. This is another factor in the situation. But in very few cases do these men expect to remain there and cast their lot with the Russians. The Russians appreciate this. They look upon the present arrangement as a temporary one.

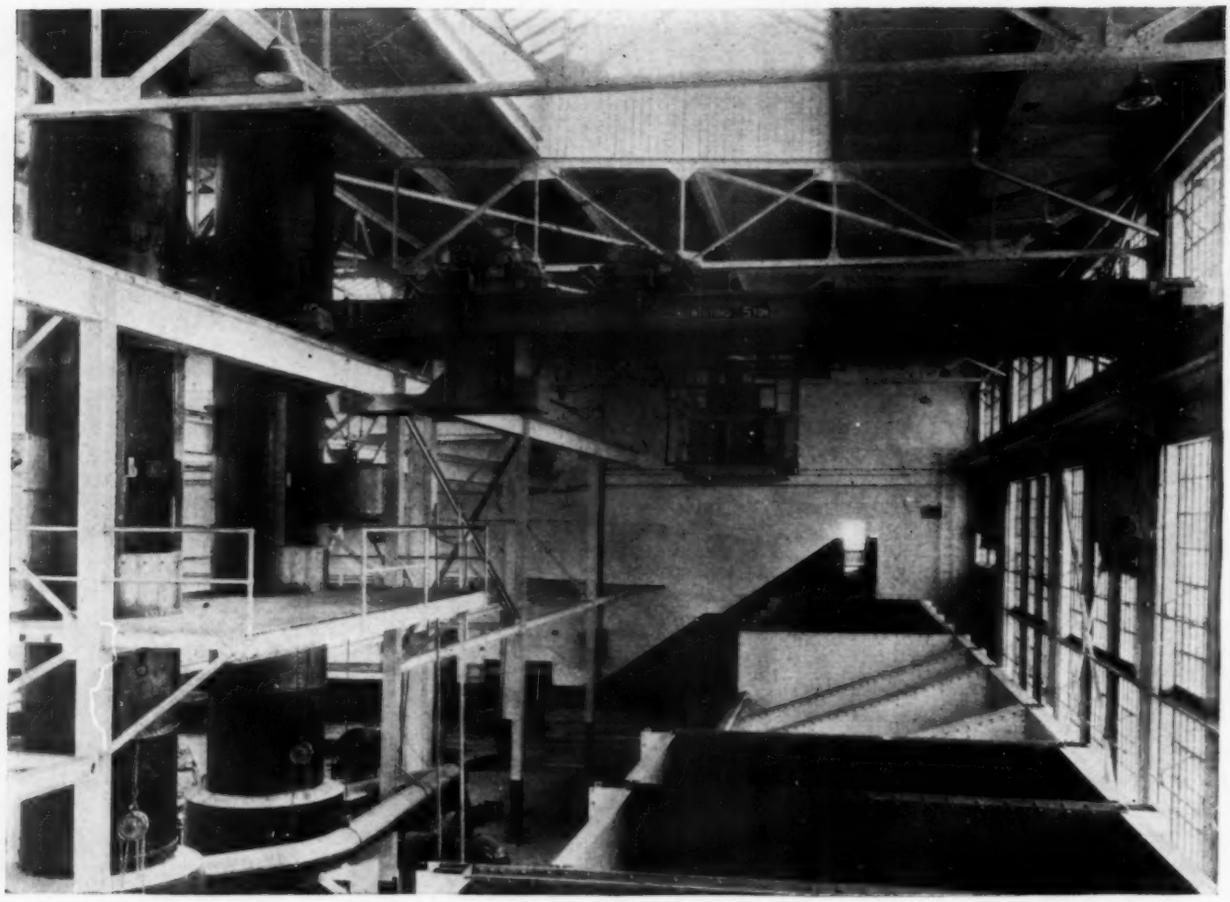
Omniscience Required

Another important factor, and one almost totally overlooked by men considering offers to go to Russia, is the fact that the Russians expect them not only to be thoroughly competent technically—even more competent than the Russian engineers themselves—but they also expect them to be teachers. Some Americans told me that, shortly after their arrival in Russia, they sat in conference with as many as twenty engineers, each one a specialist in some phase of the work with which the new engineer would be connected. They plied him with questions day after day, making complete records of the entire conference. He was expected to know everything that was ever achieved or attempted in his general field.

Some men are not prepared to stand this kind of test, and as a result may cast discredit upon the engineering profession in America. It may even be that the work they are called upon to do has little relation to the intimate inquiry being made. To the Russians, however, the whole thing is extremely important. It constitutes not only part of their training, but for some of the men down the line who are fresh from school and from books, it represents an argument against the need for foreign advice. The man who would best meet this qualification, therefore, is the student type, who keeps up on his technology.

Men sent to set up machines may be heckled by students and young engineers as to the why of this, that or the other phase of the design of a machine that has been developed by experts out of long experience and which has proved eminently successful under severe test in actual production in countries where the machine is not merely the product of one man's mind, but the product of the total experience of an industry. Failure to answer every question according to the book may discredit the foreign instructor.

No one can say definitely how long it will take to overcome these difficulties. Russia is making progress, but the tendency there will be to depend as rapidly as possible on her own resources, both human and material, and less and less on foreign experts of one sort or another. This is not likely to happen immediately, because Russia is badly in need of management technique in every phase of her industrial life. But sooner or later she will depend on home resources. In the meantime, engineers who are thinking of going there should be careful to know in advance as far as they can whether they have a contract that will continue to be mutually satisfactory and whether they care to make the necessary sacrifices.



Neatness and Economy in a Small Foundry

C. A. HARDY
Consulting Engineer, Whiting Corporation

THE new foundry of the Canadian National Railways at Point St. Charles, Que., is one of the most ideal arrangements yet developed for a small foundry, either inside or outside the railroad field. By combining certain features the engineer in charge of the development designed a building that was economical to construct, well lighted and well ventilated. An estimated saving of 30 per cent in capital investment was effected.

Usually coke and sand bins are outside the foundry proper, but in this foundry, severe winter conditions dictate that the storage bins be inside where the material can be heated and kept from freezing. This saves a brick wall and an outside crane for unloading the incoming cars. Using a Whiting "wishbone" charger for the cupola eliminates a heavy charging floor, with its expensive structure, and brings daylight to the entire floor area. This method of charging necessitates a bridge crane, which, by the addition of a second trolley, serves in loading the bins.

As the photographs show, the material bins are along one wall and are for coke, iron, limestone, molding sand and core sand. At one end, at right angles to the line of bins, is a railroad siding on which gondola cars can be brought in and unloaded under cover. Depending upon the material handled, either a clamshell bucket or a magnet is used on the auxiliary crane trolley for this purpose. Material gravitates out of the sloping bins on to a platform in front, from which it is raked into the charging buckets. Charging weights are obtained on a floor scale between the bins and the cupola, with a short stretch of roller conveyor to facilitate movement of the buckets on and off the scale. From here they are lifted to the cupolas.

The two cupolas are in front of the bins, in the middle of the building, just beyond the crane rail. Each has a 72-in. shell but one is lined to 54 in. diameter and the other to 42 in., the capacity of the former being 10 to 12 tons and the latter 6 to 7 tons of metal per hour. With the wishbone method, only a light platform is required at the charging doors for use during the lining and repairing of the cupola and when putting in sand bottoms. The crane picks up the bucket through an eye attached to the conical bottom, and when the edge of the bucket is positioned on a U-shaped shelf inside the cupola, the contents are dropped when the crane cable is released. For this work an underslung charging trolley

with extended arm is furnished. All movements are under control of the crane operator.

On the charging end there is a four-man crew, consisting of craneman, foreman and two men loading buckets.

Owing to the absence of a charging floor, the blower is placed on the main concrete floor, and clean air is brought in from the outside through an underground passage. A single direct-connected blower serves both cupolas. To the right of the cupolas and in front of the molding floor is a battery of four electrically heated core ovens, which can also be used for dry sand molds.

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A 30 per cent reduction in building investment in this Canadian National Railways' foundry was made possible by an unconventional layout in which light and ventilation are brought to every square foot of floor space.

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The molding floor in front is served by one 15-ton and two 5-ton bridge cranes. There are also several 1-ton jib cranes equipped with electric hoists conveniently located to assist in floor molding, core setting and the like. This foundry is capable of handling anything in gray iron from light car parts to locomotive cylinders; it serves the Eastern Lines for the regular run of castings and furnishes cylinders for the entire system. Facilities for making nickel additions to cylinder iron by "shot" buckets are shown over each spout.

Plenty of light is obtained from the side walls, which are made almost entirely of steel frame windows with hinged sections for ventilation. Additional light and ventilation of smoke and gases is provided by roof skylights and ample ventilator capacity. Flood electric lighting from above is used on dark, winter days. Unit heaters along the side walls heat the incoming air and direct it downward. As the pictures show, the building is of brick and steel construction, the entire interior above the bottom of the windows being coated with aluminum paint to improve the diffusion of light.

This is a layout that can be adopted by any plant planning to erect its own foundry. The building itself is economical to construct, and all available floor space is used effectively. There is no wooden superstructure. The dirt floor is replaced by concrete; darkness gives way to light and aluminum paint; and smoke to clean air.

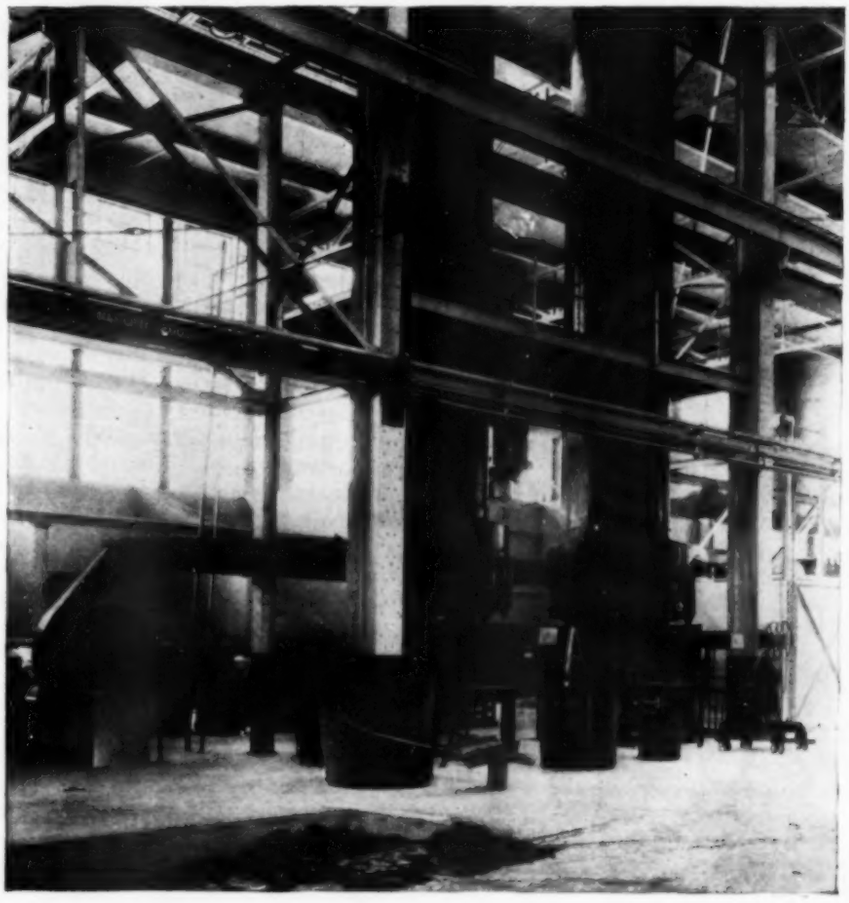
Accounting Methods Should Aid in Effecting Economies

Methods of accounting may not make much if any difference in the amount of money actually in the bank, but they can easily give one a distorted idea of the real costs of certain articles or departments. Some accounting systems, for example, charge machine maintenance to the machine inventory, in which case the cost of repair adds directly to the cost of product from this machine. Such a method enables a direct comparison with the cost of work from a new machine and shows when it is advisable to invest in new equipment.

Another method charges machine maintenance to general expense instead of to inventory and makes the repaired machine appear much more economical than it really is. Then too it makes general expense appear very large and gives the impression that there are many small leaks that should be corrected. The bank balance remains the same but management has less opportunity for improvement in the future because the distribution of costs is not clear.

Small tools also offer opportunity for different accounting methods. In most cases they are treated as supplies rather than as an investment, as is the case with machine tools and large equipment. But small tools is an elastic term and may include anything from a small drill to an expensive gang of milling cutters. Should these be charged into inventory or as a running expense?

The main requirement of any accounting is to have it show a true picture of all operating costs so that it affords a true basis on which to make improvements.



The Foreman's Round Table

Treasure Chests

"COME ON, Al. It's been quitting time all day as far as I'm concerned."

"All right, fella, let's go," replied his friend. "I can let this stuff wait 'til tomorrow."

When they were outside the gate, Ed remarked, "Say, Al, I may want to make an apology."

"For the love of Pete, for what? The mere fact that you even contemplate making one is apology enough for anyone that knows you. But, fire when you're ready. I accept it in advance."

"Oh, it's not to you. It's to that personnel man. I think maybe I haven't been quite right in some of the things I've said about him."

"Oho, he's got under your guard, has he? I thought he would. Personally I believe he's a pretty good guy."

"I'm beginning to think maybe he's either that or a damn smooth liar. I'll give him the benefit of the doubt till I catch him."

"What has he done to evoke such affection on your part, Ed?"

"Well, he came in to spill his chatter as usual, and asked me what I knew about suggestions and suggestion boxes. I told him that I knew of one plant that got 3,000 suggestions without a box and only seventeen of them were any real good."

"Your self-restraint is one of the things I admire about you, Ed; the next is your artistic lying. I'll bet the mention of suggestion boxes started you off like a hound after a rabbit," interrupted Al.

"No, honest. I might have started later, but he told me a guy had come to him with a new scheme. He was going to have umpires and prizes, and names published in the local papers, and above all an ornamental suggestion box with a big lock and key, so the men would know the foreman could not tamper with it. On the front was a place for cartoons and reminders to be placed there every day. The fellow offered to throw in the whole scheme, reminders, and the lock and key for the small price of ten dollars a box."

"Yeah, I see, at about nine dollars a box profit. Did your friend bite?"

"No, he turned him down, so he says. But here's the interesting part, if true. The guy that had the scheme went direct to the 'old man.' Then, according to the personnel man, the old man called him in and said the thing looked good to him, and why had he turned it down?"

"I suppose," interrupted Al, "you mean why had the personnel man turned it down."

"That's what I said, ain't it? Well, then the old man asked what his objections were, and the personnel man told him that he did not believe in getting suggestions that way."

"I see. What did the old man say to that?"

"He said that he was about sold on the proposition and for the personnel man to find out how many boxes would be required."

"Ow, wow, and what did your friend say to that? A flat turn down. So we are going to have suggestion boxes are we? Plus slogans, and plus everything but good suggestions?"

"Yes we are—*not*. Our hero had a comeback, so he says. He told the old man that he supposed he would be expected to put any suggestions he had to make in the box instead of bringing them direct to the old man as he had always done. The old man says, 'not at all, not at all, bring them in just as you always have.' 'Not so,' our hero replied, 'the relation of a man to his foreman is identical with that of my relation to you. Why make a distinction?'"

Is the question box of any utility, even as a reminder? What is the percentage of really profitable suggestions? Is it of benefit in pointing out to the foreman things he should have done?

Discussion of Former Topics

Run of Mine

The majority of men who work on plain production are in reality human feeding mechanisms. They operate one machine if it keeps them busy, or more if the cycles permit. This class of labor is only one step away from unskilled labor and commands a low wage. Many of them have learned their bit of mechanical ability during the first few days on the job.

The number of such men is constantly increasing with the tendency towards greater subdivision of operations and specializations in machinery. This trend is also visible in many tool rooms, especially in the larger ones. One man does not carry the job through as in days gone by. Specialists are employed and kept on one class of machines to produce the maximum. I have seen many so-called tool makers who were nothing more than high-grade lathe or milling machine operators, working on tools.

The grade of help in any trade will go down at about the same rate as that trade is simplified by machinery and divided into more-easy-to-learn subdivisions. The machinist trade is hard hit in this respect.

—L. F. Swenson.

Service or Ability

Successful plant operation requires efficient organization. An organization is effective in proportion to the morale of its members. Morale is built and maintained by hope. It is important to have a certain number of ambitious young men of vision, with good basic training in their own work, and at least the core of ability to handle others. It is also important to have many men of good to mediocre industrial ability, with restricted vision and limited ambition. These men will form the unshifting skeleton so largely depended upon for consistency in operating results. It is the foreman's first duty to foster, encourage, and train these men into the processes of his own organization. He must look for opportunities to develop the men he has. They probably represent a fair cross-section of the available labor that would be content in those particular surroundings.

New men should not be brought in without first exhausting the possibilities of the entire plant. When it is necessary and possible, the outside man should be kept on ordinary departmental work long enough to demonstrate his superiority to his fellow workers and establish his right to preference in promotion. In this way the company will retain the good will of its bulwark of substantial workers and citizens.

—Rudolph A. Johnson,
Ass't. Superintendent, Wickwire, Spencer Steel Company.

Advice, Gratis

Sometimes advice gratis is worthless. Sometimes it is worthless when paid for. Advice given to one too inexperienced to recognize its value is wasted. One has to have a certain amount of knowledge and experience to appreciate advice whether gratis or purchased.

Several years ago I had the misfortune to have an infection in the left index finger, caused by a rusty steel sliver. I, of course, sought medical advice. The first doctor x-rayed and advised amputation. The next examined and advised the same. The president of the company I worked for, after hearing the doctors' verdict, and upon receiving my request for advice, said the same thing. My next door neighbor gave me unsolicited advice which saved my finger from amputation, and the finger is almost as good as ever today.

So in this case unsolicited gratis advice proved a boon. While following the solicited and purchased advice would have resulted in my having only three fingers on my left hand today.

This experience alone has taught me to listen to all advice graciously, then go and do what I think best. On the other hand one should never give advice unsolicited unless in extreme emergency. Then he should not care whether it is followed or not. —Frank Browett,
Triangle Tool & Die Company.

Slowing Down

There has been, and is now, a perceptible slowing down on the part of a considerable percentage of the mechanics of England, and the date of the beginning of a decisive slowing down was that corresponding to the time that an eminent British statesman made the statement. "This war is a machinists' war."

That was the particular time when mechanics of all grades of ability, and who were, for various reasons, exempted from service abroad, had not only a substantial increase of wages, but an equally substantial increase in the dimensions of their heads. Never since has it been possible to find hats wherewith to fit them. At that time there was not only a slowing down, but there was also an unruliness, an opposition to constituted authority, which arose as a definite result of that particular enunciation by the eminent British statesman.

That time was, in my opinion, the beginning of the slowing down age. It still endures, and has become so habitual as to be unnoticeable by those who have no memories of the fairer working spirit of pre-war days. The younger men—those who have come into the shops of late, do not know and have no means of knowing that there is a vast difference between the attitude of mechanics as regards output, now and then, and that is why such slowing down as was then engendered exists now and has become, with many, habitual.

—J. T. Towlson, *London, England.*

Who Pays the Bills?

It is not necessary that a double check be exercised in the tool crib. When a workman is given a tool, he gives in exchange a check, which is put in the place of this tool. Every year, at stocktaking time, the workman must return all his tools to the tool crib, and reclaim his checks. The crib tender must account for all the tools of the previous year, and in addition the

new ones that have been made in the course of the year, less those that are out of use. He is responsible for the missing ones.

On the other hand, the workman must account for all his checks. If there are some missing, the factory replaces these at his expense. If there still remain some checks at the tool crib, it is because the workman has not returned all the corresponding tools. As he is responsible, he must replace these tools at his own expense. If it happens that a workman has lent a tool to one of his workfellows, who has left the factory, he is also responsible.

In lending the tool, he ought to get a check, and exchange same for his own as soon as possible.

In any case, the tools that have been lost must be paid for.

—G. DESCOLT,
Montigny de Tilleul, Belgium.

The Deadline

A salaried position, carrying with it compensations such as payment for vacation, payment for sickness, regular employment and the confidence of one's employer. should sufficiently recompense the holder for any reasonable period of overtime worked. An interest in his work and a spirit of keenness to "produce the goods" should overshadow any inclination by a salaried man to go easy on overtime because he does not anticipate extra pay for it. If payments for overtime were made, would the fact not place him in an uncomfortable position when a slack time comes along, and he still draws his full salary while regularly working less than the normal number of hours per week. Surely payment for overtime would eventually tend to lower the standard of salaries.

—W. J. HOUGH, *Ipswich, England.*

Signing Off

Williams is correct; the precautions he has outlined have the same effect on one as the sound of an automobile horn has on a jaywalking pedestrian who at once comes to his senses, and becomes more considerate of his doings.

It is logical that the managers of industrial organizations usually appoint their foremen and other subexecutives from men who admire responsible positions. However, even with men of such caliber the nature of the human mind needs some form of stimulant to keep the senses from losing their ability to observe. The management should advise its foremen and others of authority that their signatures are not mere decorations on requisitions and should indicate that they have taken the part of a critic. All purchase requisitions should by all means be signed in full and with ink to avoid further trouble and so-called, "passing the buck."

—P. L. BUDWITZ.

Advice, Gratis

The question raised looks like putting the cart before the horse . The boys evidently were of a type more suited by training and education for the farm than for a machine shop. Most shops of a high grade of progressive character would not have given them a start. The shop in question evidently was running on cheap labor, and the foreman was supposed to supply the instruction necessary for them to do the simple tasks. However, modern shops of standing and reputation cannot be successfully run with that type of youth. Trade schools are in existence, and some shops have a system of apprenticeship. Youths like those described do more harm than good. They will eventually go to another shop and bluff their way as machinists, or machine men. One or two natural-born mechanics may make good, but the others would be better off if they had stayed at some occupation needing more muscle than brain. —ARTHUR BRAMWELL.

Service De Luxe

I do not think anyone with practical experience in the machine shop would put up a notice stating that the tool crib would be open fifteen minutes before the usual starting hour, and the same period after closing time.

Whether we agree with it or not, we have to realize that there is an unwritten law that no worker shall handle any tool one second before or after the official working hours. The conventions of the work shop are, in their own way, no less exacting than those of the drawing-rooms of society, and any one infringing finds himself ostracised and his life made uncomfortable.

What is in a name? It is a question often asked. In this case the name makes all the difference. Ask a man to start work a quarter of an hour before the starting whistle, and continue another quarter of an hour after the quitting signal, and he will refuse to do it, but ask him to work half an hour over time and he will willingly do it.

The successful manager must be thoroughly conversant with the etiquette and psychology of the work people. Their customs may be wrong, but they die hard, and to convert them calls for all the resources of a diplomat.

—ALFRED C. LAYZELL.

Service or Ability

From 18 years' experience as an industrial engineer, I have found that the hiring of men from outside for subordinate executive positions, as against promoting from within the shop, must be given careful consideration.

It is true that an outside viewpoint frequently infuses new life into a department and brings to bear an experience which solves many problems with profit to the employer, but the taking of such action as contemplated by Ed can do much harm to the loyalty and faithfulness of old employees who may have equal ability.

I have yet to find plants where there is lacking ability for filling almost any position, provided the managements, as represented by the superintendent and foreman, are willing to do their part in teaching and training a likely candidate who is already on the payroll.

F. W. Taylor's requirements for selecting and training of workers were clearly stated, but only in a small number of cases has much been done toward realizing his ideal. He demanded "a corps of competent specialists whose duty it was to instruct and train the workers and assist them in connection with their work," and to set for each man "the highest task for which his physical and intellectual capacity fits him."

His plan is proved practical. It lessens the effect of machine production on workers. At the same time it stimulates ambition and raises the average ability within the plant.

—C. F. SCRIBNER,
Industrial Engineer.

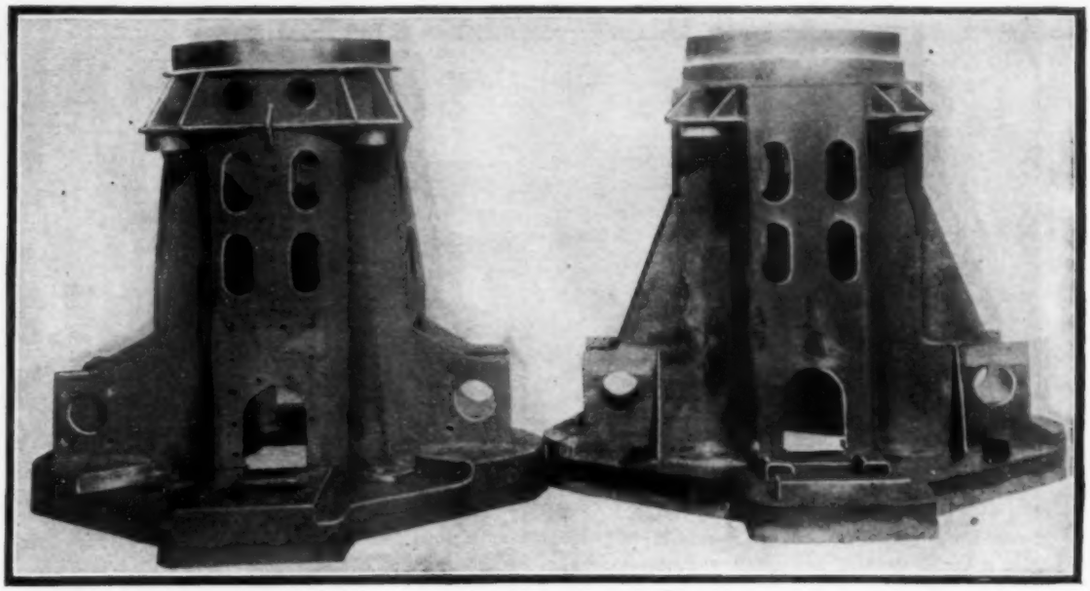


Fig. 1—Pedestal for 3-in. anti-aircraft gun mount. Casting (left) weighs 960 lb.; welded structure weighs 575 and requires less time to manufacture

Eliminating Complications in Ordnance Manufacture

Simplification of drawings and drawing sizes, closer approach to industrial standards in tolerances, finishes and materials, improved industrial conditions—these three elemental changes combine to take the mystery from Ordnance work. "Educational Orders" would completely remove the mystery and any remaining difficulties

CAPTAIN WALTER SODERHOLM
Ordnance Department, U. S. Army

THERE is a tendency among manufacturers of the country to look upon the production of those important non-commercial munitions, known collectively as ordnance, as a task associated with more than the usual measure of difficulty and grief. They remark of intricate drawings, materials difficult to procure, tolerances hard to obtain and standards conspicuous by their absence. And this in spite of the progress in production technique since the war. Management is better. There are better machine tools, cutting tools, and materials. There are new standards of workmanship. Improved shop practice and standards have led to the adoption of finer tolerances; limits that once frightened are now attained daily throughout the metal-working industry. Heat-treatment is not the mystery it was; good jigs, fixtures and gages are no longer the show things of the few. Still, a mystery hangs about ordnance production—a notion that is only a war "hang-over."

The last war was indeed a jolt for industry. It was industry's first realistic connection with the idea of "a nation in arms." It raised problems in good workmanship and quantity production that were new to many not technically equipped as they are now to solve them. A first experience of such magnitude is not soon forgotten. In consequence, the production of ordnance is still looked at, perhaps unconsciously, through the old pair of glasses.

Many overlook that the great progress in metal-working technique since the war is manifest not in industry alone; it is reflected as well in the design and development of the new munitions. Handicapped for funds, and operating under legislative restrictions from which Industry is free, the Ordnance Department has kept abreast according to its means, and has at times, as in the past, held its place in the front ranks of progress. Perhaps the fact that it holds, with enviable candor, its errors and omissions of the past clearly before its present workers bears some relation to the present status and trend of the new munitions.

"Those Army drawings!" says a manufacturer thinking back twelve years and looking distressed. Whatever they were then and why, standard drafting room practice now generally follows that which is considered the best in industry. Drawings are of four sizes, D, C, B, and A, the A size being about 14x8½ in. *One* detail, with few exceptions, is placed on a drawing—gone is the confusion of many on one sheet! The basic figure of dimensions, wherever practicable, shows the maximum metal condition.

Dimensions for woodwork, leather, fabric, unmachined

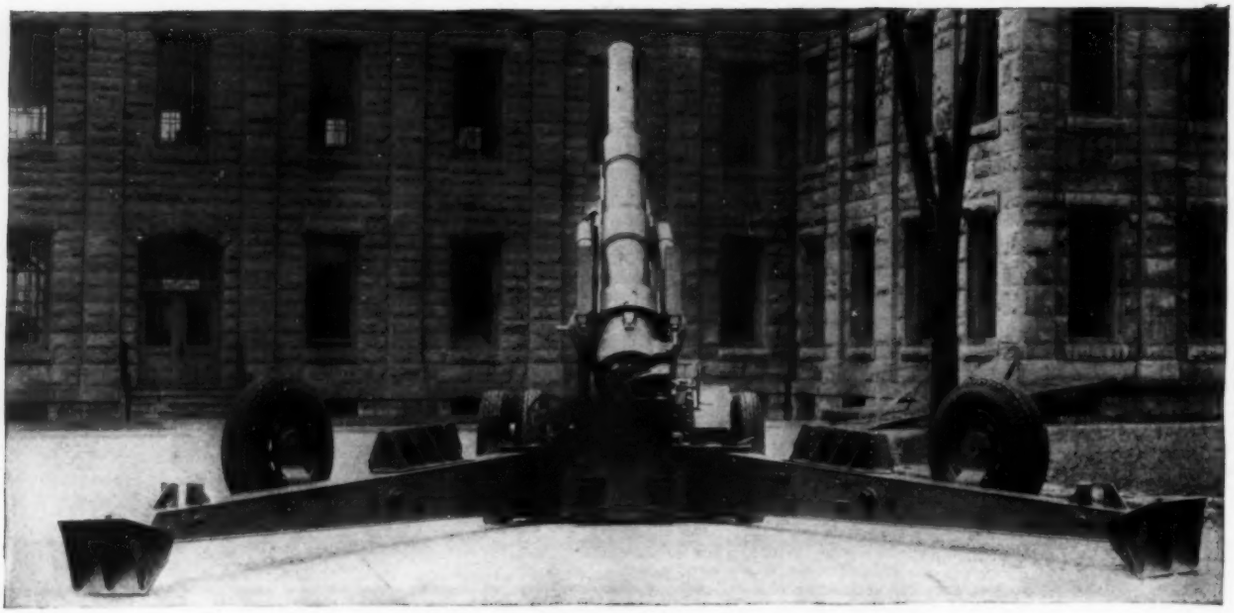


Fig. 2—New 8-in. Howitzer carriage, completed, except for the cannon, in 87 days. Clean design resulted from the use of welding

structural shapes and castings, and rough-machined parts are given in common fractions. Other dimensions are given in decimals, but not carried beyond three places except for accurate work. Drilled holes made with certain numbered or lettered sizes of drills show both the sizes and the decimal equivalents, anl holes made with drills of even sixty-fourths are written as common fractions. Tolerances are unilateral and are expressed in one direction only.

The materials of which ordnance is made are almost entirely commercial. During the war some materials were difficult to secure; many were not in general use in industry before that time. This gave rise to many difficulties until the knowledge of their working, cutting, and heat-treatment was gained and disseminated. The war came at a time when standard metal specifications were only being talked about. Generally, everybody sold or bought his own. It was the era of mystery in metallurgy and of the "secret" treatments hidden in the foreman's vest pocket. How times have changed! Today, War Department metal specifications are essentially S.A.E. specifications. Every effort is made to employ only those alloys that can be readily secured in time of war.

Ordnance standards for threads, metal fits, bearings, tooth forms, gages, fastenings, pipe and hose fittings, common industrial parts, lubrication devices, automotive parts, hand tools, hardware, and others agree with the American Engineering standards and with commercial standards in general use. The objective is to include in the designs every commercial standard and incorporate every commercially procurable part that is possible in order that war-time production will be facilitated.

Improved methods of production have been adopted to increase the ease of manufacture of ordnance. The use of welding offers some striking examples of what has

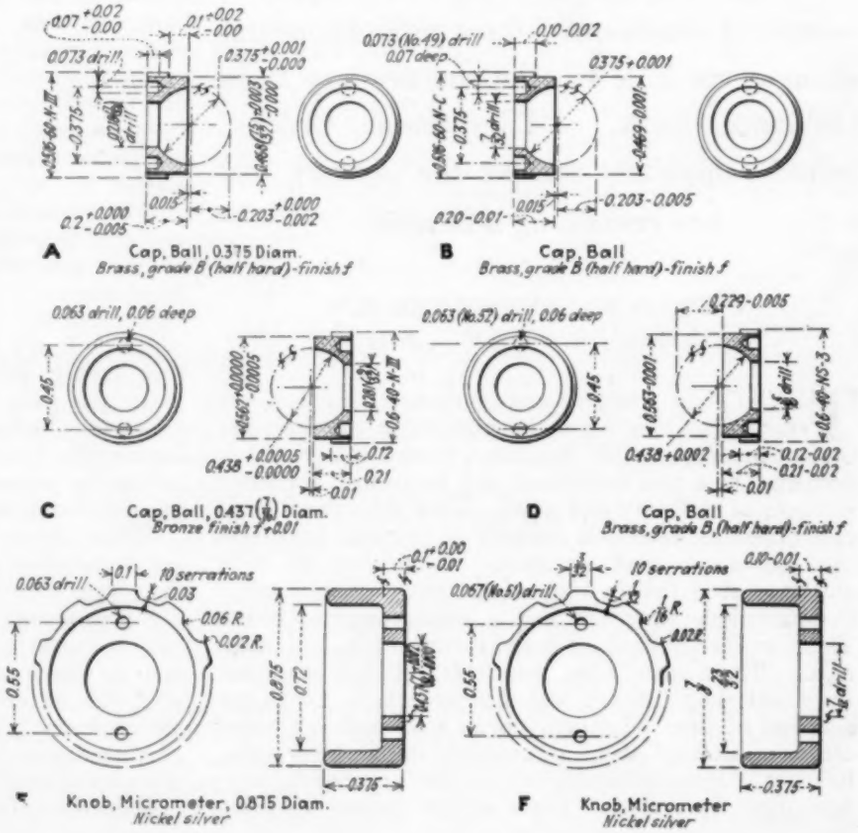


Fig. 3—Liberalization of tolerances in ordnance design. "Before" A, C, E; "After" B, D, F

been done. Heretofore, the need for high-grade steel castings of minimum weight and wall thickness for mobile gun carriages of increased power and range, set up requirements for steel castings which were not secured without a high rejection rate and the ever-present chances of early failure. The successful use of welded structures has overcome these difficulties, speeded production, cut costs and increased strength.

Not content merely to adopt industry's new practices, the Ordnance Department has developed and perfected a few of its own, the outstanding being the centrifugally cast gun body to replace the forging, and the cold-working of gun bodies—radial expansion in a container—to permit the construction of "one-piece" cannon, thus doing away with the costly and time-consuming machining and shrinking together of the tubes, jackets and breech hoop of the "built-up" gun. Growing three guns where one grew before is no mean accomplishment.

Tolerances on ordnance materiel have been the subject of much acrimonious discussion. War-time memories thereof seem to be among the most vivid. This is not to be wondered at when one looks back at the inflexible inspection, the show-room finish, the "ff" surfaces that were later to receive a coat of paint, and, to be candid about it, enough trying tolerances in almost every job to cause one, working under the pressure of those chaotic days, to challenge the need of all. Let's glance through the drawings and see what changes have resulted from bitter experience. A comparison of a part requiring a high degree of accuracy then, with the tolerances on the same part now, is interesting. In Fig. 3 compare *A* with *B*, *C* with *D*, *E* with *F*. The "before and after" effect is startling. And of equal importance, dimensions are stated so that trouble with accumulated tolerances is avoided.

Fig. 4—8-in. howitzer top carriage (above) and bottom carriage, both redesigned for welded construction

Fuses and other ammunition components are widely thought to require the finest tolerances. Yet there are no tolerances specified for ammunition parts finer than those set up by the automotive industry, and few as fine.

Then there are gun carriages for light, medium and heavy artillery. Think of the many shops producing articles that incorporate commercial ball or roller bearings. But consider this—the finest tolerances prescribed on any of these artillery carriages are those bearing bores or journals to which *commercial* ball or roller bearings are fitted. There are a vast number of factories in the country who, daily, are turning out products with far finer tolerances than are found on ordnance drawings! Not long ago the production manager of a nationally known organization asked for certain fuze drawings which he had seen previously. He said: "None of our products, accurate as they must be, need to meet as stiff a set of requirements as that fuze. I want to hang those drawings up so that our designers can see what can be done in the way of achieving liberal tolerances!"

Obviously, there is no intention here of minimizing the normal production difficulties that are bound to be experienced. The point the author wishes to make is that these difficulties are not now and need not be greater or different than those inherent to the initiation of quantity production of any good product.

Today, ordnance officers are found studying the production methods of the leaders in industry; others located in fourteen cities in the District Ordnance Offices are in daily contact with industry's ideas and practices; ordnance reserve officers are scattered throughout industry, and committees of the leading engineering societies "sit in" on the engineering work and bring to bear that outside experience and point of view without which the Department would speedily fall behind. The aim is to fit ordnance materiel for production on the machines and with the practices and skill found in industry.

Unfortunately, legislative restrictions at present prevent the placing of training orders in those shops in industry that are to carry the burden of munitions production in an emergency. Single-piece or "pilot" production of ordnance in our arsenals will not remove all those "bugs" in a design that can delay or even prevent quantity production. The designs should be "production engineered" and proved before they are in shape for better quantity production, and a set of tools manufactured that can be rapidly duplicated by others, thus assuring the prompt initiation of munitions manufacture in the event of war. No appropriations made after a war starts can equal the value in lives saved of a few comparatively inexpensive sets of tools and the "know-how" in industry that permit the conversion from peace to war without delay. Our manufacturing equipment is equalled by no nation or group of nations—why not make of it a powerful weapon of defense?

The second of three articles.

Spur Gear Teeth—*Discussion*

An inquiry and a reply

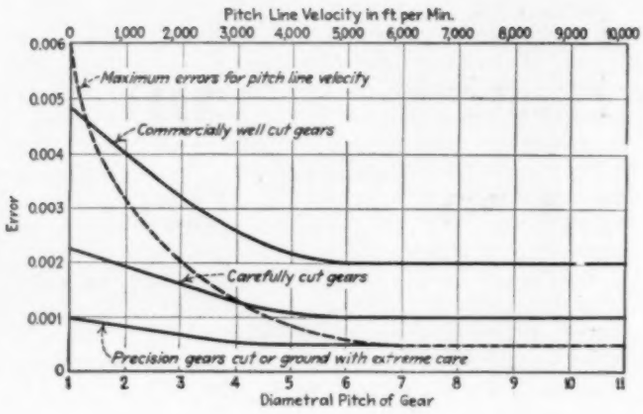
IN CONNECTION with Professor Buckingham's article (*AM*—Vol. 74, page 707), perhaps some of your readers would enlighten me as to the probable errors in commercial well-cut gears. A knowledge of this for various sizes of gears is essential for Table I of the article. Also what is semi-steel — its ultimate strength and carbon content? I notice also that, in the table of values for the constant K of the wear load equation, no mention is made of cast iron. From Professor Buckingham's last articles on the wear of gear teeth which appeared in your journal some years ago, I understood that semi-steel was simply another name for cast iron. A reading of the present article, however, disproves this, and it seems rather strange that no mention is made of the wear load factor K for cast iron in combination with other materials. —JAMES FERGUSON.

Judging from the samples received here for test, as well as from many other tests of the accuracy of gears as cut in practice, gears cut by form cutters, or hobbed, or shaped, where reasonable care is taken in the set-up of machine and work, and where the cutting machines are in good condition, show errors varying from about 0.002 in. for 10 D.P. to about 6 D.P. gears, and increasing to about 0.004 in. on gears of about 2 D.P. This condition is shown graphically on the accompanying graph.

When accurate ground hobs, or shaping cutters are used, and the finishing cut is taken on one side of the teeth only at a time, the results indicated on the graph, as "Carefully Cut Gears," should be obtained. Incidentally, I have recently checked some 3 D.P. hobbed gears which showed errors of about 0.003 in. These gears, after testing, were recut in the same machine with the same hob, finishing one side of the teeth at a time, and the error was thus reduced to about 0.001 in. When the gears are carefully ground, or cut with extreme care with accurate ground tools on machines that are kept in first-class condition, the results indicated on the graph as "Precision Gears" should be obtained.

Incidentally, the noise of operation is a good test of the relative accuracy. Thus for gears which are to run at pitch line velocities of 6,000 ft. per min. and over, if the errors exceed about 0.0005 in., the noise of operation will generally render them unsatisfactory. For pitch line velocities of from about 3,000 to 5,000 ft. per min., an error greater than 0.001 in. will make them too noisy for general use. For pitch line velocities of from 1,500 to 2,000 ft. per min., an error of about 0.002 in. is about the greatest that should be permitted.

For pitch line velocities below 1,500 ft. per min., the errors may amount to 0.005 in. without unendurable noise. These conditions are indicated by the dotted ink



line on the graph as "Maximum Errors for Pitch Line Velocity." These orders of accuracy should be maintained regardless of the pitch. I do not claim any theoretical or mathematical authority for these graphs, but they show what seems to be more or less general experience.

The semi-steel referred to in my paper is gray iron with from 20 to 30 per cent steel scrap. The values for K given in Table VI for semi-steel also apply to gray iron. This semi-steel has an ultimate strength of about 40,000 lb. per sq.in.

With a greater percentage of steel scrap, the modulus of elasticity is increased, its tensile strength is increased, but its compressive strength is not increased but may be reduced, so that it may not be a good material for gears. For example, I recently tested some "high-test" semi-steel gears where the steel content had been increased to about 50 per cent. The modulus of elasticity was increased to about 19,000,000, while its fatigue limit in compression appeared to be about 80,000 lb. per sq.in. The resulting value of K would be 120, while the increment load would be increased over cast iron and semi-steel with the lesser steel content because of the increase in the modulus of elasticity. As a result, this material is not a good material for gears.

—EARLE BUCKINGHAM.

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Next Week

In the event of war, every qualified executive and operative in the metal-working industry will be called to furnish ordnance materiel. Next week, Captain Walter Soderholm will present the final article in his notable series, "From Mining Machinery to Ordnance Gun Mounts."

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Germany has evolved a standard of cylindrical fits that finds wide industrial acceptance. But manufacturers in this country have failed to attain uniformity

Hole Tolerances and Tool Manufacture

JOHN GAILLARD
Standardization Engineer, American Standards Association

IN ESTABLISHING a standard system of fits between cylindrical parts, should hole tolerances be chosen primarily to secure the greatest clarity and facility for the machine designer combined with the maximum degree of interchangeability between internal and external parts? Or should the choice of hole tolerances be based mainly on considerations of the tool problem, such as the possibility of using one size of new reamer for all holes whatever their tolerances may be? If the former question is to be answered in the affirmative, this would mean that the hole tolerances should be plus tolerances on the nominal hole sizes, but if the latter question is thus to be answered, the hole tolerances must be taken downward from a common reference line.

The above questions have come up as the result of criticism raised against the American standard on fits. (American Tentative Standard B4a-1925 on "Tolerances, Allowances, and Gages for Metal Fits," now under revision.) A special aspect of the problem has been given considerable attention during the past year in *Amercian Machinist* when a system of hole tolerances extending downward from a line located 0.0005 in. above the nominal size of the holes was described and discussed.

In its general aspect, the problem involves the criticism that has been raised against the American standard on the ground that the standard holes cannot be finished economically with the present sizes of commercial stock reamers. To take a concrete example, a 1-in. American standard hole has a low limit of 1.0000 in., and a high limit of 1.0030, 1.0013, 1.0008, or 1.0006 in., depending on the "class" of the hole. The reamers listed in the catalogs of the tool manufacturers are held within a small plus tolerance on their nominal size. Thus, one of the prominent firms supplies its 1-in. reamers between the limits 1.0000 and 1.0003 in. Such reamers soon wear down to the point where they begin to produce holes whose size lies below the nominal, which holes are not acceptable according to the American standard. Therefore, even though reamers worn down to this extent may still be in good condition for further use, they must be retired from production. Such loss of useful reamer life raises the cost of producing standard holes unduly, those objecting to the American standard say. This attitude has apparently been one of the reasons why the present American standard has not become more widely introduced into practice.

An analysis of the problem shows that the essential questions involved appear to be those mentioned in the beginning of this article, or put in a simpler form: Shall the hole tolerances control, or be controlled by, the tool situation? The fact that this question still looms up even though it has been answered in twelve countries, including the United States, to the effect that the system of hole tolerances is the most important factor, seems to justify further discussion, especially so as it has been solved in practice in at least one important industrial country where national standard fits have been generally adopted, that is, Germany. We shall come back to this later in this article.

The present situation in the United States seems to exist because two parts of the same problem have got out of step instead of remaining coordinated. The older practice of giving a tolerance on a part consisted in permitting an equal plus and minus variation from its nominal size. Instead of being unilateral as required by the present American standard, the tolerance was a bilateral one.* The high limit of a hole with such a bilateral tolerance is located more closely to the nominal or basic size than the high limit of a hole with a unilateral plus tolerance of the same numerical value. Furthermore, the minus portion of a bilateral tolerance makes undersize holes lying within a certain range acceptable and permits the present commercial reamers to wear down further, and therefore to be used longer, than does a unilateral plus tolerance of equal value. The manufacturing limits of the present commercial stock reamers are still adjusted to the old condition instead of to the modern standard holes with unilateral plus tolerances. This means that in principle the harmony between hole tolerances and reamer sizes has been disrupted. In fact, to be produced economically the present American standard holes should be finished generally speaking with reamers whose sizes are held between limits lying farther above the nominal size of the hole than the limits of the present commercial reamers. A 1-in. reamer intended for finishing a 1-in. class 2, American standard hole (limits 1.0000 and 1.0013 in.) should not be held between 1.0000 and 1.0003 in. as are the commercial reamers mentioned above as an example, but say between the limits 1.0005 and 1.0008 in. Evidently,

*Bilateral tolerances may occasionally be used with advantage where a given size is aimed at to be approximated as closely as possible in an absolute manner, such as the nominal size of certain kinds of limit gages or a distance between the center of holes. However, unilateral tolerances have been found to be preferable for a general system of fits between cylindrical parts laid down in a national standard.

the high limit of the reamer should be held a certain distance below the high limit of the hole with a view to the possibility of the reamer's cutting oversize.

When the question is raised of changing the sizes of stock reamers to adapt them to the requirements of American standard holes in the way referred to above, objection may be expected on account of the usual difficulties inherent to making a change from existing practice. Such difficulties, however, are bound to occur in a certain degree during any period of changing over from an old to a new standard. Another objection, which has been raised in giving consideration to this problem, is that the tool manufacturer instead of having to keep one reamer in stock for each nominal size would have to carry a reamer for each standard hole tolerance, that is, four different reamers for each nominal size of hole. The nominal sizes of certain types of commonly used stock reamers as now listed in tool catalogs step up by increments in diameter as small as $\frac{1}{32}$ in. The prospect of having to multiply the number of stock reamers by four must indeed appear like a nightmare to the tool manufacturer and practically form a bar to the solution mentioned. Fortunately, things are not always so dark as they appear at first sight, and further consideration of the present case will show how and why the situation could practically develop in the right direction without any considerable difficulty, and more specifically without requiring the prohibitive variety of reamer sizes feared by some.

It is the writer's earnest belief that if American standard holes became generally adopted, and if therefore the reamers most suitable to produce them came into greater demand, these tools would automatically become a stock product readily available without extra charge. Such a result could, of course, be attained only by the combined demand of a large number of users for the new kind of reamers, based on their decision to use the American standard fits and the holes required for these. This belief is not based on a mere theory, as it has been shown that similar conditions have worked out in actual practice. If doubt arises whether the general adoption of the standard fits by industry would indeed have this effect on the tool situation, attention may be called to the production of standard fits between threaded parts and the relationship between these fits and the taps for producing the internal threads. Since standard limits for threads on bolts and nuts were established in 1924 (American Standard B 1a-1924 on Screw Threads for Bolts, Nuts, and Commercially Tapped Holes) to secure specific classes of fits between the two groups of parts, several tool manufacturers have been supplying as stock tools four different taps for each nominal size of thread. The taps have a tolerance of 0.0005 in. on the pitch diameter and the tolerance on each kind of tap has a different position relative to the basic profile of the thread. The pitch tolerances on the four taps are respectively: minus 0.0005 in. to basic; basic to plus 0.0005 in.; plus 0.0005 to plus 0.0010 in.; and plus 0.0010 to plus 0.0013 in. This enables the user of taps to select from the series of four that particular tap which is most suitable to the fit required in his case under the existing conditions as to material to be tapped, speed of tapping, lubrication, and other factors. Ten years ago the idea of establishing, for the same kind of thread, four different taps whose individual tolerances on pitch diameter all lie within so small a total range as 0.002 in. would probably have been decried by many as too refined and too complicated a scheme to be practicable. Yet the system has materialized as a result of the fact that the American standard screw threads and their fits have become widely adopted in practice.

Another example, proving that the practical adaptation of tools to the requirements of the standardized product is brought about automatically, provided the standard for the product be generally adopted, is the relationship between cylindrical fits and reamers in Germany. In that country, a national standard on fits established in 1920 has been generally adopted by the national industry. In 1930, its adoption was close to 100 per cent, to judge among other things from the orders on limit gages received by gage manufacturers. In fact, orders on nonstandard gages have become exceptional. Another proof of the remarkable success of German standard fits in practice is its adoption by more than one thousand German industrial organizations, manufacturing mechanical products covering a wide range, from precision machine tools and limit gages to agricultural machinery; from automobiles and trucks to cash registers; and from electric motors to diesel engines. Firms like the German General Electric Company (AEG) and Siemens Schuckert Works, in the electrical field; the Maybach Motor Company and the Daimler-Benz Works in the automotive field; and the Friedrich Krupp Company manufacturing a large variety of products, have stated to be using the standard successfully, to mention only a few important ones.

The German standard comprises both the basic hole and the basic shaft system. A large German manufacturer of tools and gages stated to the writer in 1930 that 80 per cent of the gages ordered from his firm are intended to serve fits in the basic hole system. As this system is in principle similar to that laid down in the American standard, even in that it makes provision, like the latter, for four different plus tolerances on the basic hole of a given nominal size, the following facts concerning the relationship between hole tolerances and tools in German practice are of interest.

With a view to producing correctly their standard basic holes, the Germans have established a national standard (DIN 369) on gage rings for reamers. These are rings intended for setting an expansion reamer to the correct size required for finishing the hole. Two types of such rings have been standardized in Germany as shown in Fig. 1. Type A is intended for reamers with a diameter up to 100 mm. (about 4 in.) inclusive, and Type B for reamers from 100 to 150 mm. (from about 4 to 6 in.) The standard gives, among other dimensions, the nominal diameter D of the bore of each ring and the tolerance on that diameter. The numerical

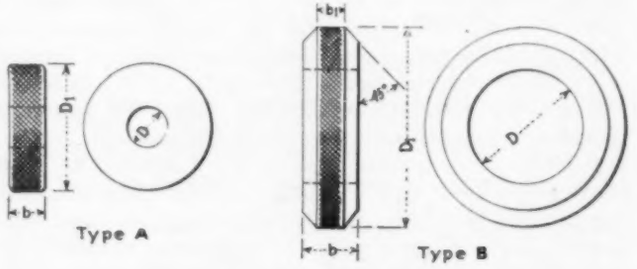
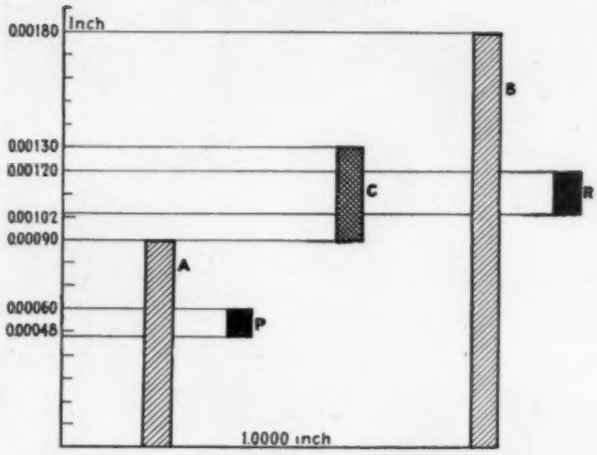


Fig. 1—Ring gages for reamers have been standardized in Germany as an important phase of hole tolerances. The gages shown are for reamers below 100 mm. and between 100 and 150 mm. respectively

Fig. 2—The German tolerances on basic holes, reamer sizes, and gage ring bores are carefully coordinated



A = tolerance on a "fine grade" hole
B = tolerance on a "medium grade" hole
C = tolerance on a reamer before final sizing
P = tolerance on the bore of a ring for gaging a reamer for a "fine grade" hole
R = tolerance on the bore of a ring for gaging a reamer for a "medium grade" hole

value of D is based on the formula (not given in the standard):

$$D = d + 2/3\ h$$

in which d is the basic size of the hole to be finished by the reamer, and h the tolerance on that hole. In other words, the size of an expansion reamer set with a standard gage ring, will be smaller than the maximum size of the hole to be finished with that reamer by an amount which is equal to at least one-third of the tolerance on the hole. This provision takes care of the requirement that even though the reamer may cut oversize, trespassing of the high limit of the hole should be avoided.

To illustrate the German system, Fig. 2 shows on the left hand side the tolerance A on a German "fine grade" hole with a nominal size of one in., this tolerance being 0.0009 in. In accordance with the above formula, the nominal size of the bore of the corresponding gage ring for the expansion reamer is 1.0006 in. A manufacturing tolerance on the bore of the gage ring being required, such tolerance is given in the minus direction from the nominal size. The tolerance P on the bore of the gage ring under consideration is 0.00012 in., the limits of the bore being consequently 1.00048 and 1.0006 in. A 1-in. German standard hole of the "medium grade," whose tolerance B is 0.0018 in., is shown on the right hand side in Figure 2. The bore of the gage ring for setting a reamer to finish this grade of hole has a nominal diameter of 1.0012 in. with a minus tolerance R of 0.00018 in., the limits of the bore of this gage ring consequently being 1.00102 and 1.0012 in.

No German national standard has as yet been adopted for the manufacturing limits of solid reamers. According to the list of the German tool and gage manufacturer referred to above, solid reamers are supplied with the same sizes as those prescribed for expansion reamers by their gage rings. Particularly interesting is the fact, that in 1929, the German Association of Precision Tool Manufacturers published an agreement made between its members concerning the supply of solid reamers. Stock reamers are held between such manufacturing limits as will permit their being ground, when ordered, to the size suitable for finishing a hole with a specific standard tolerance. An extra charge for this adjustment in size is made only for orders on less than six reamers. Consequently, for an order of any importance, the reamers intended for holes to give standard fits are supplied at the catalog prices.

Fig. 2 shows how the tool manufacturers' agreement works out for stock reamers for holes with a nominal size of 1 in. The reamers are manufactured without advance knowledge of the tolerances on the holes for which they are to be used. They may have to be adjusted to the requirements of a "fine grade" hole or of a "medium grade" hole whose tolerances are represented in Fig. 2. This figure illustrates the case of an important German firm which holds its stock reamers, before their final sizing, between the limits 1.0009 and 1.0013 in. (tolerance C). When reamers for "fine grade" holes are ordered, these stock reamers must be ground down to such extent that they will pass the corresponding standard gage ring, the limits of whose bore are 1.0006 and 1.00048 in. If the stock reamers are to be used for standard "medium grade" holes, they must pass the standard gage ring with a bore whose limits are 1.0012 and 1.00102 in. The diagram on the right hand side of Fig. 2 shows, that in this case, reamers whose original size lies within the lower part of tolerance C are suitable without any further adjustment, while reamers whose size lies closer to their high limit must be ground to a slightly smaller diameter.

Incidentally, stock reamers are made only for holes with nominal sizes belonging to the German standard series of diameters (DIN 3). For example, within the range upward from 50 to 75 mm. (about 2 to 3 in.) inclusive, only the following diameters are standard: 52, 55, 58, 60, 62, 65, 80, 70, 72 and 75 mm., or ten sizes.

From the above, it will be seen that German tool manufacturers have adjusted the manufacture of their reamers on their own initiative to the requirements of the national standard fits. A German engineer who had a large share in the development of the national standard on fits in his country, has declared that the Germans when setting up their standard system of fits, paid no attention whatever to the reamer sizes, considering this as a factor that would take care of itself once the standard fits, and therefore standard hole tolerances, would have become generally adopted. As explained above, matters actually have developed in this way. The German situation also shows that the adjustment of stock reamers to national standard hole tolerances does not necessarily lead to considerable variety in reamer sizes in manufacture and stock-keeping. One set of limits is observed in manufacturing the stock reamers, these limits lying well above the basic size of the hole. In this way, the stock reamers have enough metal to give long wear while cutting oversize holes, and they also permit of being ground down, if necessary, for becoming suitable to finish the finer grade holes. In Germany, the reamers technically and economically most suitable for producing standard holes have thus practically attained the status of a national standard themselves, with consequent benefits to all parties concerned.

Among previous articles appearing in *American Machinist* on this subject are: "Tolerances and Tools" by D. W. Ovaitt (Vol. 72, pages 903 and 956) with discussions by R. Hoppe (Vol. 73, page 597), John Gaillard (Vol. 73, page 727), Dr. N. N. Sawin (Vol. 74, page 289), "Practical Hole Tolerances," by D. W. Ovaitt (Vol. 74, page 316) and a discussion by W. G. Holmes (Vol. 74, page 349).

Fig. 1 — Boring a rifle barrel out-of-doors with a geared, hand drive. The barrel is fed over the bit by hand

Boring Rifle Barrels in the Tennessee Mountains

Fig. 2—An indoor boring machine with cranks for two men. The feed is by hand as before

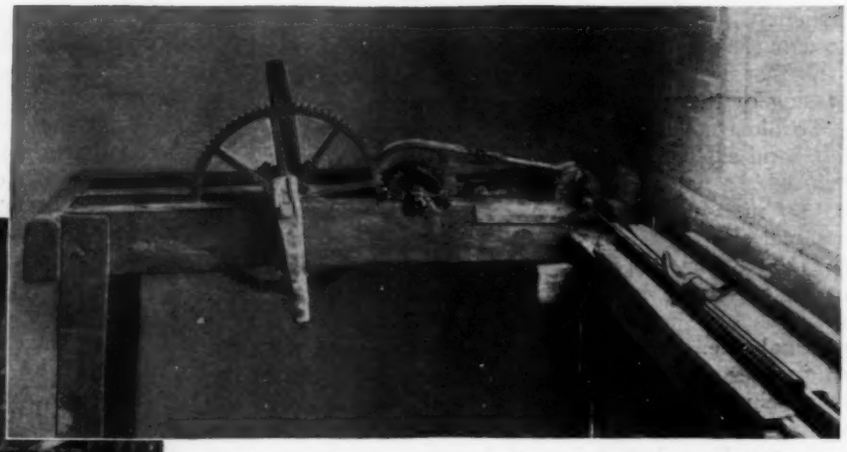


Fig. 3—Rifling the barrel. The twist is obtained by forcing a long screw through a nut, both being hand cut from hickory

The barrels are forged from flat iron bars lap welded over a rod to give the approximate internal dimension. In welding, only about an inch is done at a time. It takes half a day to form a 48-in. barrel

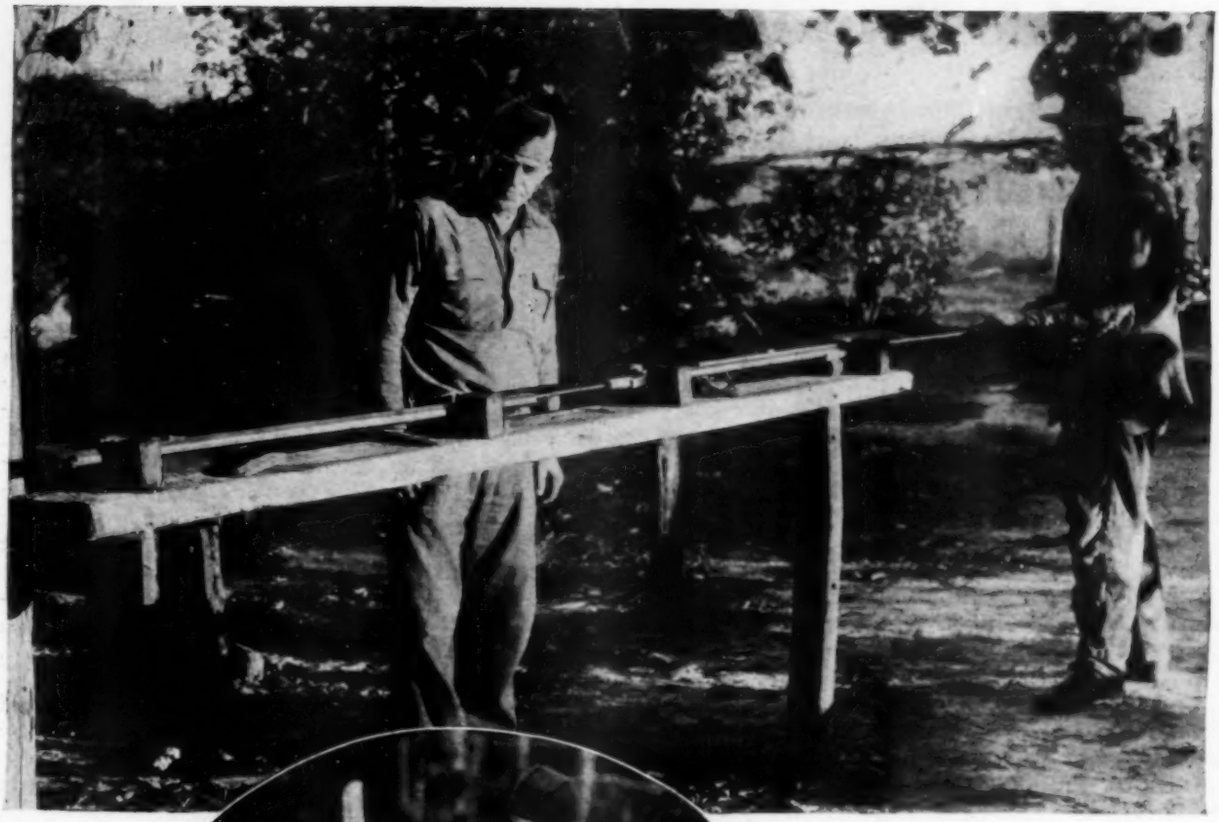


Fig. 4—Another rifling method, using a finished rifle barrel to guide the saw or cutter

Fig. 5—Inspecting the barrel and straightening. Except in detail and in apparatus the method has not changed since pioneer days

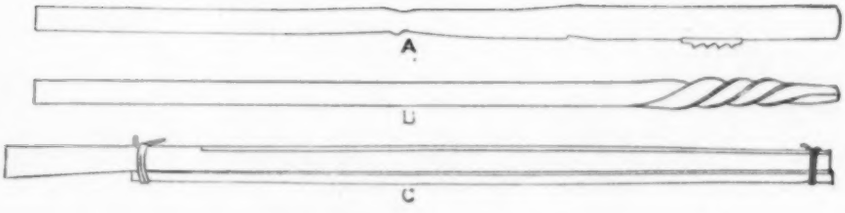


Fig. 6—A—Rifling cutter, or "saw," set in a hickory head. B—Short bit for roughing the bore. C—Long bit or reamer for smoothing the bore. The hickory guard prevents scratches

Photographs by courtesy of
The American Riflemen and Walter M. Cline

Five SAE Papers

Presented at the Tenth National Production Meeting in Detroit

SOME 2,303 spot welds and 140 in. of flash-welding are incorporated in the all-steel automobile body of the sedan type, according to JOSEPH W. MEADOWCROFT and JAMES J. POUGH (assistant works manager and welding engineer, Edward G. Budd Mfg. Co.) in their paper, "Welding Indispensable in Production of All-Steel Bodies," presented at the opening session. All-steel welded bodies have certain advantages over composite bodies, among them being fewer parts.

Wood and steel react so differently to stress that neither adds much to the strength of the other in a composite structure. Steel alone, welded into a unit structure, is lighter and less bulky. To achieve this result, Budd stamps the entire side of a body from a single sheet, with the openings die-formed to reinforce it. Chassis frame and body follow the same lines, so that they reinforce each other; body sills can be omitted, thus saving 2 in. in over-all height. Flash-welding is employed to join 120-in. sheets to any desired width, largely because mills are not equipped to produce sheets of the required accuracy economically and speedily. This flash-welding requires uncommonly accurate alignment, secured by a scarfing operation that trims both edges of a sheet at once. Magnetic clamping makes the pressure self-contained, and the operation is done in a specially developed machine. Tonneau rear seams are flash-welded also; the cowl and roof are attached by spot-welding.

Inventory Control

Inventories received first consideration in the now well-established financial-control policies of the General Motors Corp., according to C. B. STIFFLER (Oakland Motor Car Co.), in "Inventory Control." Recogntion of the importance of turnover was one of the several factors that led to a study of minimum stocks. Formerly it had been thought necessary to place orders for materials far in advance of needs to assure the supply, but thanks to cooperation from suppliers and transportation agencies, restricting orders to suppliers to three months in advance has been satisfactory for the past ten years. This has eliminated the losses from revaluation of inventories and cancellation of commitments with suppliers that occurred in 1921, and has supplied a new aim for inventory control.

Under the present system, each car division of the corporation submits monthly a definite forecast based on 10-day reports of stocks and reports of actual and estimated sales from dealers. This forecast, which covers the current and three forward months, estimates the number of cars to be sold by the dealers, delivered to the dealers, and manufactured. Acceptance of this forecast is authority for the division to proceed with manufacturing and with procurement of material according to it. In place of large stockrooms, a limited amount of space is assigned for stock near the point where processing begins. The plant is zoned, with an experienced man in charge of each zone. He has little use for any record except a shortage report which shows which items need attention. The efficiency of handling has been improved until a supply for three days is normal. Minimum banks of processed material also are maintained.

An example of the resulting speed of handling is this: A carload of frames loaded in Milwaukee on a Thursday afternoon arrived in Pontiac Friday morning, were assembled into automobiles, a carload shipped to Milwaukee Friday afternoon, and the cars delivered there to purchasers on Saturday afternoon.

"Preparation of Sheet-Metal Parts for Enameling," was presented by F. P. SPRUANCE (American Chemical Paint Co.). Wrong cleaning methods are the commonest and most troublesome cause of failure of the enamel finish of radiators and other sheet-metal automobile parts. Extensive research in salt-spray and humidity cabinets revealed an alkaline condition of the rinse water to be largely responsible for failures of the enamel finish. Even where alkali washes were not used, the city water used was found to contain enough alkali to leave spots where drops dried and left faint rings of hygroscopic salts which absorbed moisture through the subsequent enamel, creating rust.

The remedy was found in a special form of phosphoric acid that overcomes the surface tension of the drops of rinse water and at the same time neutralizes the alkalinity without creating an acid condition.

The need for a separate operation between the alkali rinse and the priming has recently been eliminated by the introduction of a primer containing decomposable phosphates that react with the surface of the metal on baking so as to overcome any rusting tendency due to invisible rusters on the surface and to etch the surface slightly, thereby creating a good bond between the steel and the enamel top coats.

The Thursday session began with a paper on "Development of Machining by Pressure as Applied to Forgings," by J. H. FRIEDMAN (National Machinery Co.) giving a number of interesting examples of the possibilities of this new process, also called "hot coining," for obtaining accurate low-weight forgings. The author also discussed hot coin forging of connecting rods and similar parts and offered some information of pressure forging of non-ferrous metals. He also referred briefly to the straightening and sizing by pressure of malleable castings.

Permanent Molds

"Casting Iron in Permanent Molds," was presented by J. L. DOSTAL (Manager, Holley Permanent Mold Machine, Inc.). Paradoxically, permanent molds for casting iron are made from the same metal that is poured into them. Master patterns are metal faced or made from hard wood, no finish being required in the impression. The dry-sand core made from the master pattern is coated with graphite. The mold is normalized after casting, then machined on its faces and coated with a refractory facing. An additional coating of acetylene smoke is applied automatically in the molding machine.

Standard 12-head semi-automatic molding machines are generally used for quantity casting. One man pours continuously; another ejects the castings. If cores are required, a third man sets them. Single-head machines are used for small quantities and special machines for castings too large for the standard equipment. Such is the progress of the art that castings which seemed impossible a few years ago are considered simple now. In fact, within a few years cylinder blocks and virtually all other castings for automomibles will be thus cast.

Automatics on Fine Instrument Parts

HERBERT CHASE
Consulting Engineer

In cooperation with the
Weston Electrical Instrument Corporation

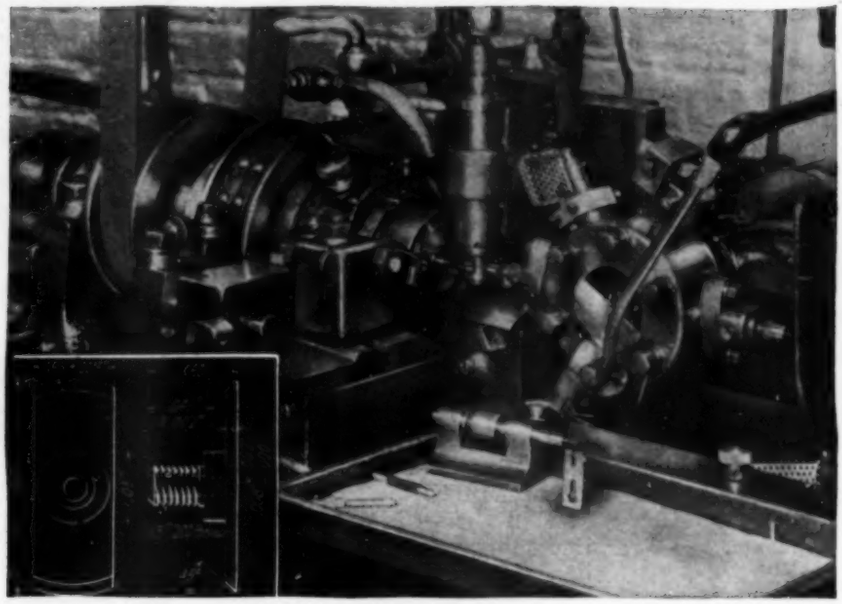


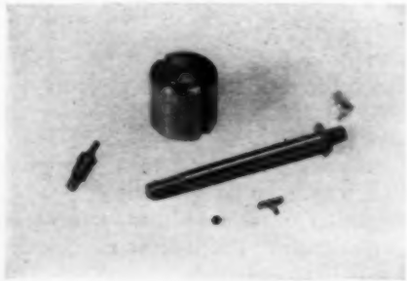
Fig. 1—A special head is used to straddle mill the part thus avoiding a second set-up

ESPECIALLY fine automatic screw-machine work is produced by the Weston Electrical Instrument Corporation in the manufacture of delicate instruments for precision measurement. Parts for these instruments are held within extremely close limits, much closer than is common for automatic screw machines.

To do this, certain precautions are exercised that may sound commonplace but are too often neglected. These include: keeping the machines in first class mechanical condition; insistance that tools be exactly right; extreme care in set-up, often involving the use of special gages made solely for this purpose, and always including strict adherence to carefully prepared written instructions; and finally, a rigid inspection that sometimes involves scrapping pieces which do not measure up to specification.

When once set up and running properly, the machines are generally allowed to run continuously during each shift or until the scheduled run is completed. The product is checked regularly at half-hour intervals as it falls from the tools. If these pieces do not pass inspection, it is the usual practice to scrap all of those made during the preceding half hour, as in general, they are so small that it would not pay to attempt to sort the good from the substandard. Gages for inspecting the parts are kept at each machine and are checked each week to assure maintenance of the desired accuracy.

One of the most precise jobs turned out is that on the top pivot base shown in Fig. 1. It consists of a base, only 0.008 in. thick, 0.055 in. wide, and 0.156 in. at its largest diameter. The male threaded stud has 200 threads per inch and projects from a circular central boss. A hole is drilled in the threaded portion and reamed to 0.0147 ± 0.0001 in. This part is made from 0.156-in. diameter brass rod. When finished, it is used to mount the pivot that guides the staff for a swinging member. This carries the indicating pointer of the instrument.



Tiny screw machine parts are made to such close limits that it is cheaper to reject a half hour's production than to inspect each piece

The pivot base, as well as the other pieces here described, is produced on a Brown & Sharpe automatic screw machine. In this instance, a No. 00 machine is used with a spindle speed of 2,400 r.p.m. A circular form tool, mounted on the front slide, performs the first operation. This consists of cutting off the previous piece, rough forming the threaded diameter of the new one, and forming the boss and the beveled flange. The piece is supported in a stop on the turret during this operation. Next the diameters and faces of the piece are finish turned and centered, using a B & S center and face-toolholder in the turret. Drilling is done with a No. 79 drill in a turret chuck, after which the spindle is stopped.

Milling the shoulders and slabbing off the sides of the flange are done with a pair of special form milling cutters, mounted on the rear cross slide and driven at 1,500 r.p.m. by a vertical shaft with universal joints. The spacing between the two cutters is adjusted in the set-up by using collars that vary in thickness by only 0.0005 in. The projecting portion is threaded with a button die in a revolving holder turning at 1,200 r.p.m. on the turret. The hole is reamed using a broach reamer, which is merely a cylindrical wire ground flat on one side and brought to a sharp point to do the cutting. When reamed, this hole must have a diameter between 0.0146 and 0.0148 in., the sizes of the "go" and "not-go" ends of the plug gage used to check it. After cutting off, the pieces are tested for runout on the threaded diameter by

slipping them on a small gage mandrel and rotating them under a dial gage which must not show more than ± 0.001 in. eccentricity. Limits held on other important dimensions are shown on the drawing of this piece. The gross production rate is 170 pieces per hour.

Another unusual piece is a screw pin or stud, which is threaded on both ends and has a hex flange between them, making it necessary to roll the second thread before the piece is cut off thereby saving rechucking. As Fig. 2 indicates, the limits required on this piece are not so close as on the one previously described. This part is made from hex brass rod measuring 0.187 in. across the flats and is produced in a No. 00 machine with a 2,400 r.p.m. spindle speed.

The stock is fed, and the 0.10-in. diameter is turned with a hollow mill. Next, this same diameter is threaded with a button die for a part of its length, the die being fixed in the turret. This finishes the outer end, which is supported in a holder on the turret while the portion back of the flange is turned to size, using a circular tool in the front cross slide. Finally the thread rollers, coming on on the rear cross slide, roll the thread on the diameter just turned, and the piece is cut off. Only a thread gage is required for this piece. The time per piece is fourteen seconds. Obviously, this performance would not be possible if a second set-up were used.

One of the smallest pieces, made to dimensions that are exceedingly close so far as the internal threaded diameter is concerned, is a brass nut made from hex stock that measures only 0.043 in. across the flats, and is only 0.035 in. wide. One end of this nut is beveled, and its internal diameter at the other end is recessed. The tap has 200 threads per in. and an outside diameter of 0.030 in. When completed the nut must have a full thread which is gaged with a tapered plug measuring 0.025 in. the small end and 0.026 in. at the large end. A line at the large end of this plug marks the point beyond which the nut must not pass to meet inspection requirements.

This piece is made on a No. 00 machine with 3,600 r.p.m. spindle speed at the rate of four seconds per piece. The first operation is to center and counterbore, using a flat drill. A No. 72 Morse drill of 0.025 in. diameter machines the hole to be threaded, and this hole is tapped, using a 3-fluted tap of 0.030 in. outside diameter. Both drills and the tap are held in turret chucks. One end of the piece is chamfered with a circular form cutter on the rear cross slide, and finally, the nut is cut off with a tool in the front cross slide. In addition to the plug gage for checking the inside diameter of the threaded hole, a thread gage is employed, chiefly to insure a proper root diameter.

Among the many other brass parts made in this department, there are several considerably larger than those described. One of these is the binding post shown in Fig. 3. It is turned from ¾-in. round bar stock on a No. 2 machine having a 1,200 r.p.m. spindle speed. This piece is unusual only in that the cross hole is drilled while the piece is in the screw machine. In the first operation, a circular form tool on the front cross slide turns the outside diameter while a hollow mill on the turret rough turns the shank. The same diameter is finish turned and chamfered, using a B & S No. 22 box tool in the turret and then is threaded with a ¼ in. 40-thread button die mounted in the turret and driven by a belt and bevel gears at 600 r.p.m. In the succeeding operation, the cross hole is drilled, the drill being mounted in the chuck

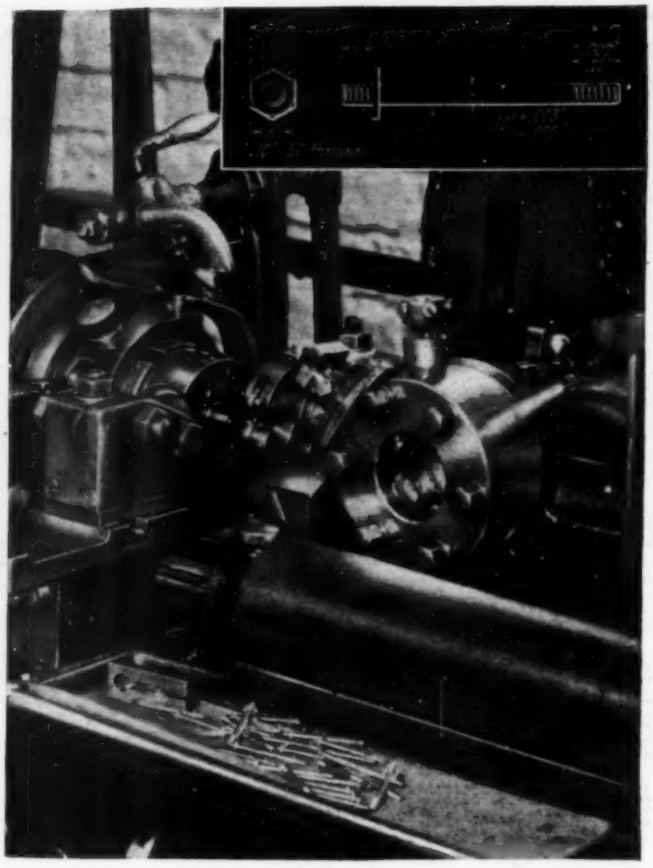


Fig. 2—The front thread is cut and the back thread rolled to complete the piece in fourteen seconds

of a B & S drilling attachment on the rear cross slide, driven at 1,500 r.p.m. from an overhead round belt. Finally, the piece is cut off, using a swing tool actuated by the front cross slide.

A thread gage only is required for this piece, which of course, has to be chucked in another machine for drilling and tapping the axial hole in the large end. The time per piece in the first machine is 70 seconds.

A number of small pieces, which require work on both ends, necessitating rechucking, are made in this department and some of these are fed to the second machine through magazine chutes. One such piece is the bridge support. It is made from 0.104 in. hex stock on No. 00 automatics with 2,400 r.p.m. spindle speeds. Two diameters are turned on the first machine, using a hollow mill which also cuts a slight undercut on the shoulder between the two diameters, the smaller of which is held to 0.052 ± 0.00025 in.

The second machine is equipped with the magazine chute which is kept filled by a boy who tends two machines and also gages the pieces. The first operation is to insert the piece into the chuck and to turn the 0.0545-in. diameter with a hollow mill. The 0.04 in. diameter and radius are turned at the end, using a B & S box tool, and this diameter is threaded with a button die having 200 threads per in., after which the chuck opens and the piece is ejected. Time per piece in the second machine is seven seconds. The chute is made up special and is mounted on the machine, the carrier being mounted on a double movement cross slide. A collar for adjusting the hollow mill is fitted to it to facilitate holding the close tolerances specified. "Go" and "not-

go" ring gages and a thread gage are used to check these pieces.

What may appear at first glance to be a relatively simple screw machine piece is the cylindrical core shown in Fig. 4, but in reality, it is a difficult and exacting piece to make because of the close limits specified, especially on the slot dimensions. As the drawing indicates, the slot width is held to ± 0.0005, as is also the distance from the bottom of the slot on one side to the bottom of that on the other side, while the outside diameter tolerances are + 0.0001 and — 0.0009 in. Naturally this requires extreme care in the set-up. Dial and fixture gages used in the set-up as well as in gaging finished pieces are shown in Fig. 5.

Special screw steel of 19/64 in. diameter is used for this piece. Pieces are made in 22 seconds on a No. 0 machine with a 1,492 r.p.m. spindle speed, and must come from the machine with a highly polished finish. The first operation consists in cutting off the previously finished piece and forming the radii with a circular formed cutter on the front cross slide. The outside diameter is rough turned with a No. 20 B & S box tool and finish turned with the same type of tool, the latter removing only 0.005 in. of stock to give the high finish desired. At the end of this operation, the spindle is stopped, and the special milling attachment mounted on the back cross slide is brought into position.

This attachment has two spindles with three cutters mounted on each. The spindles are carried in eccentric bushings, which are rotated to adjust center distances and depth of cut, and are also adjustable axially. Cutters are fed in successively, the first one being 0.045 in. thick, the second 0.056 in., and the third 0.061 in. The third cutter is formed to chamfer the edges of the slot. Collars, carefully ground to thickness, space the cutters

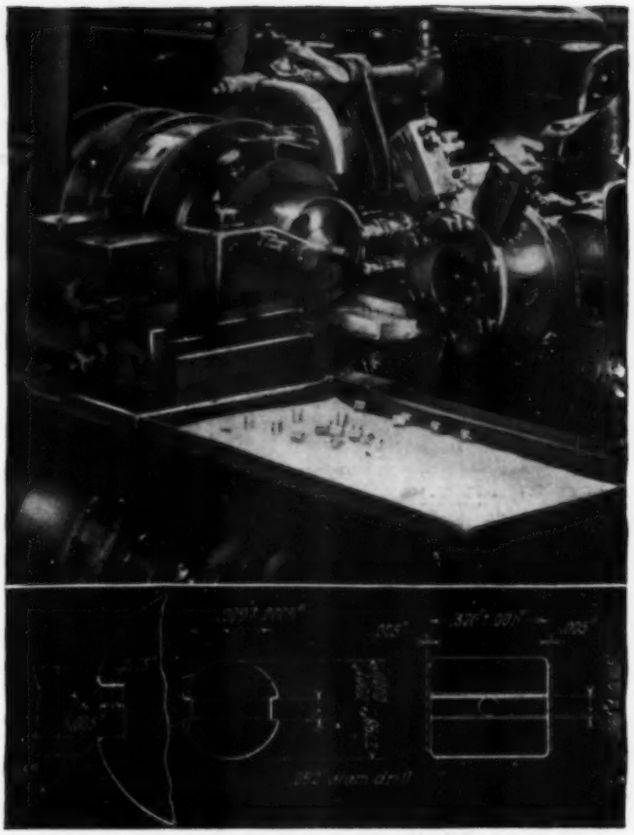


Fig. 4—Slots are finished to half a thousandth on the screw machine by use of a special milling head

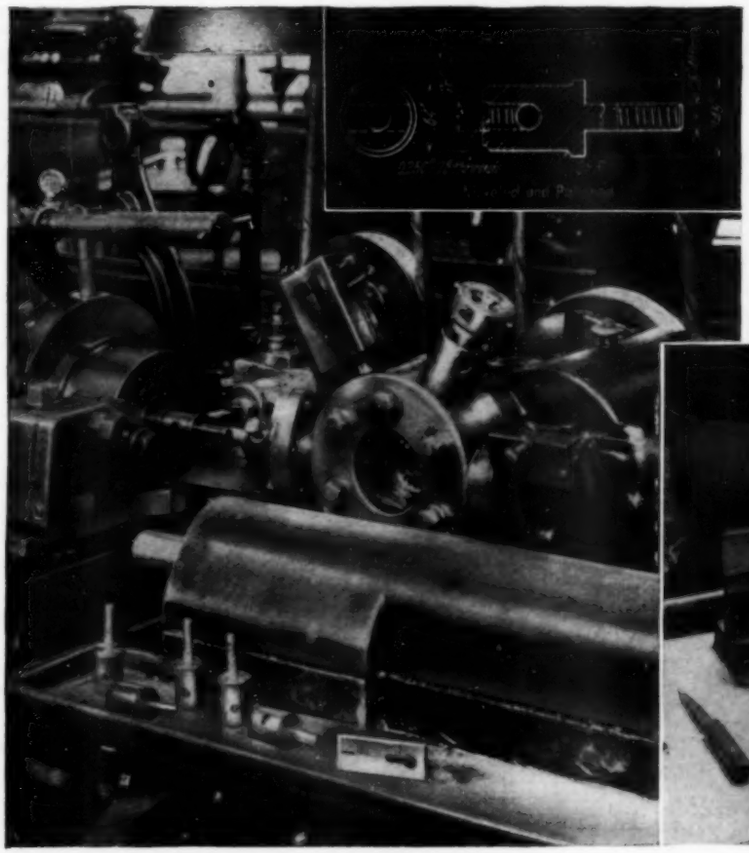


Fig. 3—A drilling attachment on the rear cross slide finishes the transverse hole before cutting off

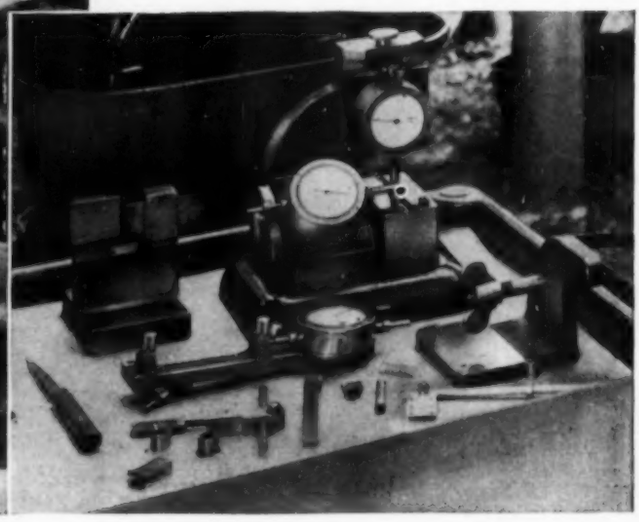


Fig. 5—Periodically samples are inspected with extreme care. Here is the equipment used for setting the machine and measuring the work shown in Fig. 4

the correct distance apart. The cross slide is fed with corresponding exactness to assure correct positioning of the cutters, so the slots will be of proper width, parallel to the axis, and located correctly. In the set-up, each tooth of the slot cutters is checked with a dial gage, and every precaution taken to keep the tools in first class condition.

Among the gages, employed for checking the work, is one having two dial gages mounted at right angles, one above and one at the left of the part to be gaged. The part is fitted into a slotted base with a tongue that engages the lower slot while the gaging is done. The upper dial gage affords a means of checking the depth of the slot, and the dial gage at the left checks the width of the slot and its location with respect to the axis. Other gages are provided for checking parallelism of the slots and the distance between their bottom faces.

A great number of other pieces, presenting unusual problems in machining, and many others, more nearly conventional, are turned out daily in these screw machines. The examples given illustrate the extreme care that is taken to maintain a high standard of accuracy.

Ruminations on Replacement

JAMES B. CHAPIN

BELIEVE it or not, one of the largest textile mills in the United States was lighted by kerosene lamps until some years after the War—the World War, not the Civil War!

The mill management professed to believe that kerosene illumination cost less than electric lighting. The lamps were already installed and their value written off the books. The kerosene was cheap, and there were helpers who could fill the lamps in their spare time, as they had to be in the mills anyway. The lamps had given the best illumination available in mill districts 30 or 40 years previously, and apparently that did not seem a long period in the petrifying minds of that management. Of course the light was pretty faint, and spilled oil, spoiled a little cloth now and then; but these mills always had made cloth without electric light, and the executives had electric lights in their offices anyway.

The cloth was as good as it had been when it was the best made in this country 30 years before, and the fact that it was no longer the best in the country did not seem to worry the management. But their managerial sins, of which the lamps were a symptom, finally found them out after the 1921 depression, and a very expensive and not yet profitable reorganization was necessary.

Machinery users in other industries may say that such a situation could exist only in the textile industry, and that the foregoing has no lesson for them. Before we say that our case is different, let us consider what old equipment is in our shops and check our reasons for keeping it when something better is on the market. Our lighting may be up to date, but how many of our producing units are contemporary with the kerosene lamp and the carbon filament bulb?

Can we believe that the old machines cost us nothing because they are all written off the books? Forgetting for the moment that there may be an accounting fallacy in that statement, the highest single expense item is usually operators' wages. Obviously in most cases these cost far more per unit on old machines than on modern ones. Further, old equipment does not attract ambitious operators; although it may never appear on the cost records, it is always subject to intangible expenses.

Perhaps we say the old machines are used mostly for short runs and that a new machine would not pay for itself on such work. This is sound only in the rare cases when set-up time and cutting time on the old machines approach those on the new machines. Modern machines are designed for fastest possible set-up as well as for the fast removal of metal. Fast handling of a number of short runs is in the aggregate as important as rapid production on long runs.

Perhaps we have the old machine run by an operator who knows its idiosyncrasies and makes it produce extraordinarily well. There is no excuse for the management which ties itself unnecessarily to special skill or furnishes skillful men with anything but the most productive tools.

Or do we keep the old machine for company for some old employee whom we feel obliged to retain on the payroll? Why should not old employees be permitted to work efficiently as well as younger ones?

The old machines may be as good as the day they were installed. So were the kerosene lamps, but in comparison with modern products old equipment has little brilliance. Let us practice rather than merely know about the various formulas which indicate when it is worth while to buy new equipment for given jobs. Let us consider what our old equipment would bring in the used market, and decide whether we would buy it again, or whether we would buy modern equipment if we had no machines in our shop for the work now done by the old ones. Would we buy similar old machines to equip a shop for competition with our present business?

Let us not ignore the tonic effect new equipment always has on the morale of entire organizations and the benefits which come with the renewed enthusiasm of men who appreciate that they are working for a progressive management, one that has faith enough in its future to install equipment to make better product at lower cost.

And let us not forget for a moment that better product at lower cost has always been one of the essential stepping stones out at periods of depression, periods from which managements of the kerosene lamp type rarely recover.

A Flagpole to Cure Shimmy

A certain shop had reciprocating machinery so located that their vibration was transmitted to the building, causing it to shake violently. A specialist was called. After making a survey, he directed that a wooden flagpole be erected on the roof of the building and that it be anchored securely to parts of the steel framing which vibrated violently. He also stipulated that a heavy steel ring weighing perhaps 20 to 30 pounds be forged to such a size that it could be slid up and down the pole.

When this had been done and the machines started, it was found that the pole swayed violently as had been expected. But when the collar was raised and lowered a place was found at which the vibration of the building was damped out. A steeple jack was then sent up the pole to anchor the collar permanently at this critical point and to cut the rope which had held it previously. What the specialist had done, of course, was to provide the building with an inverted pendulum having a period that counteracted the vibration of the building itself.

Ideas from PRACTICAL MEN

A Quick-Loading Foolproof Jig

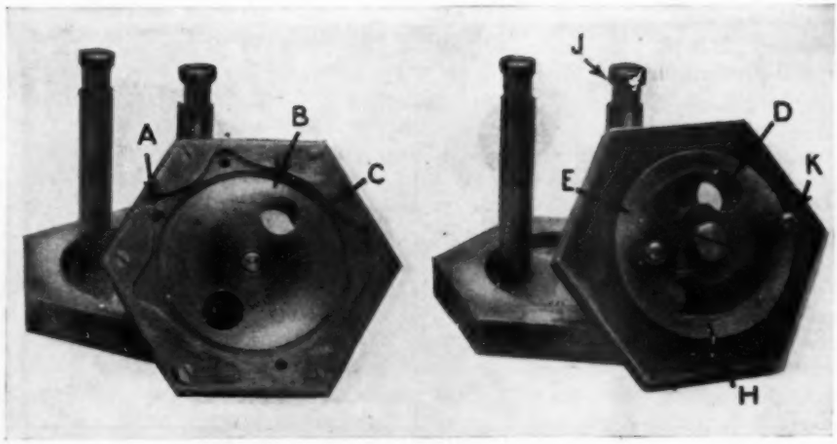
SAMUEL CAUNTER
Pioneer Instrument Company

The jig shown in the illustration is for drilling five holes in the sides and two holes in the flanges of Bakelite-molded instrument cases. It is so designed that it adjusts itself to any irregularity in the overall length of the cases within certain limits; yet if the irregularity is greater than the limit allowed, the jig cannot be closed. Neither can it be closed if the work is not correctly positioned.

In Fig. 1, a case is shown in the jig ready for drilling, also two cases that have been drilled. The five holes drilled in the skirts of the cases have a definite position in relation to the lugs and the holes in the flanges, and must be within a tolerance of 0.001 in. from the shoulders of recesses in the bottoms. In Fig. 2 the jig is shown ready for loading, the under side of the top plate being outward. The work is located at the points *A*, *B* and *C*, the nest allowing it to be placed in one position only. One of the pillars is larger in diameter than the other to prevent the top plate from being put on in any but the right way. These features have been effective in preventing spoiled work through incorrectly positioning the cases.

Fig. 1

Fig. 2



In Fig. 3, the top plate is shown with its upper face outward, the locking plate *D* being visible. The locking plate is pivoted to the top plate and is counterbored on its under side at *E* to receive a steel ball and a spring. A dimple in the top plate coincides with the ball when the holes for the pillars are in line in both plates to permit them to be put in place over the pillars. When the holes are in line, the ball snaps into the dimple, yet permits the locking plate to be easily rotated to lock the work in the jig. At *H* are cam surfaces having a lead of 0.016 in. in 60 deg. of rotation, which bear against the undersides of the shoulders *J* on both pillars. Thus by rotating the locking plate, the top plate is forced down upon the work. At *K* are finger pins by which the locking plate is rotated.

A Fixture for Cutting Cams

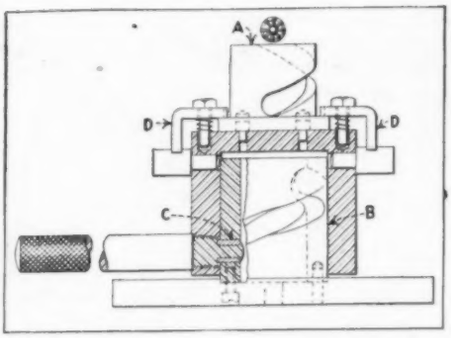
PHILIP F. SHAFRAN
Machine Shop Instructor,
James Monroe High School

In the illustration is shown a fixture that was used for machining the helical grooves in a large quantity of bronze cams, such as the one indicated at *A*. To the base is attached the hardened cylinder *B*, in which is machined the master groove. Fitting over the cylinder is a sleeve closed at the upper end and provided with a lever for rotating it. The inner end of the lever projects through the wall of the sleeve and carries the cam roller *C*, which engages the master groove in the cylinder.

Dowel pins in the closed end of the sleeve engage dowel holes in the base of the work, locating it on the fixture. The work is held down by the clamps *D*, the tails of which bear upon plugs in the sides of the sleeve. Elongated holes in the clamps permit them to be pulled back from the work, so as not to interfere with loading and unloading. Springs under the clamps hold them up when the bolts have been loosened which saves time when changing the work.

In operation, the fixture having been set up in correct relation to the end mill for milling the groove, a blank is mounted on and clamped to the fixture. Moving the lever to the right causes the sleeve to rotate and the roller

to follow the master groove in the cylinder, thereby rotating and raising the blank. With the end mill fed into the blank, the rotating and raising motion results in a groove being milled of the same lead as that of the master groove in the cylinder. The master groove is just the right length so that its upper end acts as a stop.

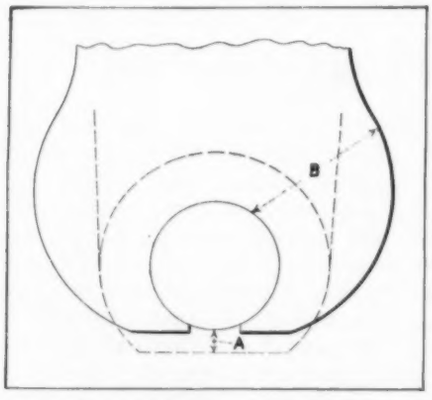


Since the only motion necessary is the turning of the lever, it was possible to set up the fixture in a lathe, the end mill being held in the chuck. Thus the only milling machine of which the shop boasted was released for other and more urgent work.

Anti-Friction Bearing for a Milling Machine Arbor—*Discussion*

HARRY SHAW
Consulting Engineer, Heywood, England

The disadvantage of the bearing for the milling machine arbor described by J. Conrad Watson in an article under the title given above (*AM.*—Vol. 74, page 692) is that it limits the height of work that can be mounted on the table. The bearing prevents the approach of the work nearer to the arbor than the distance *A* in the accompanying sketch. Mr. Watson could not very well have avoided this condition, having used a standard outboard support for the arbor.



If, however, a new support is to be made, I would recommend that it be made to the shape shown by the full lines in the sketch herewith. If so made, the work can be brought practically up to the ball bearing. It will be quite strong, since the extra metal at *B* will prevent it from opening.

Variations of Thread Form

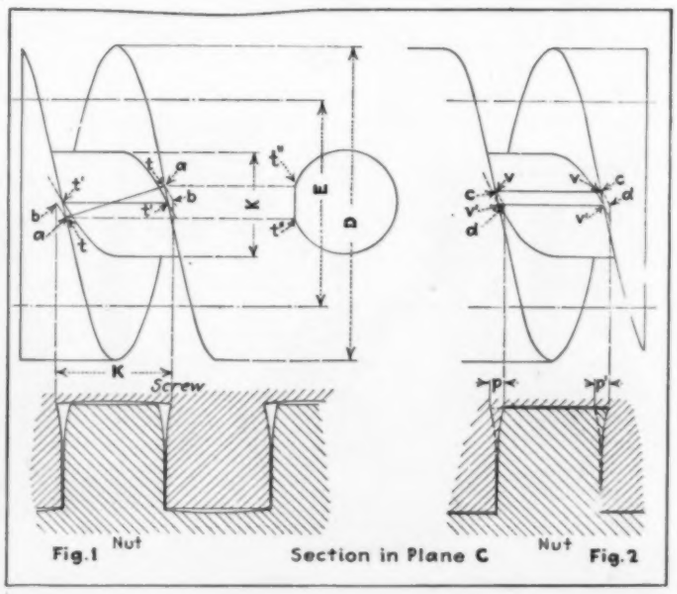
WILLIAM S. ROWELL

Much as been written about variations of thread form caused by setting thread tools off the plane of the screw axis. All threads are dimensioned in this plane which will be known as *C*. It would seem that the direct, if not the easy way to secure threads true to dimensions, would be to use a tool true to dimensions, set it in plane *C*, and the desired results will follow. But there are mechanical reasons why this cannot always be done.

All cut threads are produced by cutting parallel helical grooves of the form of the mating thread, leaving between them threads of the form of the mating grooves. Thus our work is cutting grooves true to thread dimensions when measured in plane *C*. Any shifting of a standard form of tool from plane *C*, will change the form of the grooves and the threads at *C*. Some form of top rake is often given tools; this may change the form of thread unless compensated by corresponding changes in the tool form. That these changes are often so slight as to be negligible, does not alter the truth. In case the helix angle is high, the change must be taken into account if good work is secured.

The helix angle varies directly as the lead and indirectly as the diameter. Thus, the lead remaining constant in any given case, we find the helix angle increasing as the axis is approached. The angle is usually given only at the pitch diameter *E*. The variations of the helix from the major diameter *D* to the minor diameter *K*, produce curved sides in the threads when a standard tool is shifted from plane *C*. This is shown in Figs. 1 and 2.

Fig. 1 shows a square thread groove 3 in. in diameter with a 2-in. lead. A square thread is chosen because its greater width at the root produces a greater modification of the thread form, when the tool is set out of the plane *C*. Similar changes occur in all thread forms. Such a square thread would be produced by a flat top tool set in plane *C;* but because of the excessive helix angle, especially at the root diameter, cutting would be difficult. Common practice is to set the top of the tool *tt* normal to the thread at the pitch diameter, thus partly equalizing cutting conditions at the nose of the tool. In this particular case, a full width tool shifted from *t't'* in the plane *C* to *tt* normal to the helix would increase width of thread groove slightly at the outside diameter, quite appreciably at the pitch diameter, and a prohibitive amount at the minor diameter. This is because plane *C* cuts the thread groove obliquely because of the helix, which is about 12 deg. at *D*, the outside diameter, 17 deg. 39 min. at *A*, the pitch diameter, and 32 deg. 29 min. at the root. As the oblique distance *t't'* across the groove at the plane *C* is greater than the approximately normal distance along line *tt*, the tool that is the correct



size in plane *C* is too wide at the root diameter. Usually such a change of tool will result in a groove widened at all points; but it might easily happen that in certain cases the groove would be narrowed at *A*, the outside diameter. The changes in the width of groove, and corresponding changes in width of thread, are caused by changes in obliquity of the tool to the groove. Short dotted lines *ab*, show how the groove is widened at the root diameter in plane *C*. With no attempt at geometrical accuracy, the sides of the threads and grooves in plane *C* would be as shown in section. This shows the fallacy of the common belief that if tools are the same for screw and nut and are set the same, the resulting threads will mate and fit properly. In this case, we see an approximate fit at the outside and a sloppy condition at the root. The concave bottom of the groove results from the straight nose of tool cutting deeper at its center than at its corners, when set obliquely to plane *C*, as shown in Fig. 1 where *t"t"* represents the nose of the tool. A similar concave bottom is seen in the groove of the nut, but not so much, because of greater diameter. Though the nut groove is cut from diameter *K* to *D*, instead of from *D* to *K*, its form will be the same as the screw, if cut with a like tool with a like setting. Each, in this case has a groove wide at *K*, obviously resulting in a thread narrow at *K*, which results in sloppy fit at the root of the screw and fair fit at the outside diameter. If the helix angle were slight at the outside diameter and large at the root, there would result an interference at the outside though the tools were of normal groove width at plane *C* and the settings identical. That is, if the setting of the tool normal to the helix angle at the pitch diameter results in increased obliquity of tool at the outside diameter, a positive interference is set up at *D*, because of the narrowed groove and widened threads.

Fig. 2 shows result of top rake, or to be more exact, of setting tool above plane *C*. Top rake in itself, causes no change in form of groove, except when, by its use, the cutting edge of tool is shifted from plane *C*. Here is shown a standard width tool *vv*, shifted from *v'v'* in plane *C*. The short dotted lines *cd* show how, in this case, the groove remains standard width at plane *C*, but is undercut at the right, giving a convex groove side, and filleted the same amount at the left giving a concave groove side. A standard tool set at *vv*, produces a groove standard width at plane *C*, because *vv* is parallel with the axis. The undercut and fillet are caused by variation in the helix angle from *D* to *K*. A screw and nut with such a thread would mate only when both headed the same way, but if placed head to tail, interference would be in evidence. Such interference would be likely to develop in the case of a taper screw and nut. Taper screws are usually cut with small end of taper toward dead spindle of lathe, and taper nuts are cut with large end toward dead-spindle. As reversing them, putting the large end of the screw into the small end of the nut, is out of the question, the interference shown in section at *p*, and the opening shown at *p'* would result. This would become more pronounced as the diameter decreased and the helix angle increased toward small end of taper.

Threads true to dimensions can be produced by tools not set in plane *C*, but the tools must be modified to compensate for difference in the width of groove where the tool is set. Computing such changes in a tool is almost out of the question because of the many factors controlling them. The practical way out is to generate the tool. That is, produce the tool's curved cutting edges while it is in the same position in relation to the axis of rotation of cutters producing them, that it will be in relation to screw axis while producing threads. Mr. Charles Higgins described this correctly (*AM*— Vol. 25, page 526).

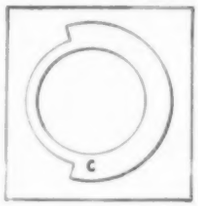
Like other forming tools, a thread tool produces finished work-form, independent of traverse; and any change in the setting of the tool in relation to plane *C*, produces a change in work-form. While these truths seem to be sensed, many lack a clear and definite picture of their cause and effect.

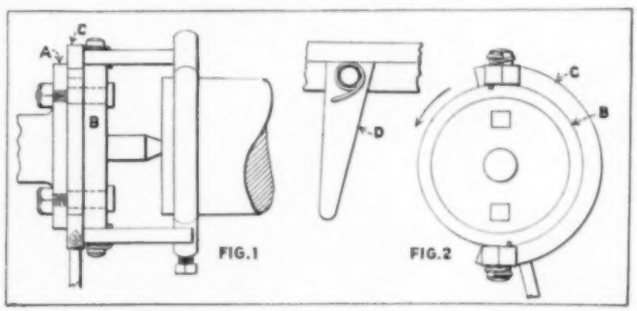
A Double Driver That Permits Facing the Headstock-End of Work

WILLIAM H. MOORE
Hamilton, Ontario, Canada

A driver that permits the headstock-end of work to be faced without disturbing its position on the centers is shown in the illustrations, in which like letters refer to the same parts. The use of the device on heavy work eliminates the necessity for a crane, or hoist, to hold it while turning it end for end for facing. It may also be helpful on work where a second set-up is undesirable.

Referring to Fig. 1, *A* is the ordinary driving plate of the lathe. Secured to the driving plate by bolts is the plate *B*, having two diameters. The thrust ring *C* is a running fit between these plates, its inner diameter bearing on the smaller diameter of the plate *B*. The thrust ring is prevented from revolving by a bar, one





end of which is screwed into the periphery of the ring, while the other end rests on the lathe bed. The outer diameter of the thrust ring is reduced for part of its circumference by cutting away part of its periphery, as shown in Fig. 2. Two driving arms are pivoted on bolts in the periphery of plate *B*, each bolt head carrying a spring, the other end of which fits into a hole in each driving arm. A double-tailed dog is clamped on the work.

In operation, when one of the driving arms reaches the beginning of the cut-away portion of the ring *C*, it is drawn out of the way of the tool by its spring and assumes a position parallel to the driving plate. When the heel of the driving arm reaches the end of the cut-away portion of the ring *C*, it strikes the blunt end of the portion that is not cut away it is forced to a position at a right angle to the driving plate, as at *D*, and

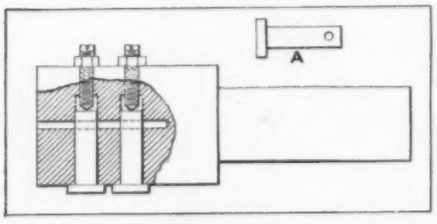
takes up its work of driving. After this driving arm resumes its work, the other arm goes through the same movements. Thus the cycle goes on, the arms alternately driving and releasing the tails of the dog and clearing the tool.

While each arm is driving, its heel bears on the face of the thrust ring, but the friction of the two surfaces can be greatly minimized by the use of heavy grease. I have wondered if anyone has ever thought of a device for this purpose. I have never heard of one and would be interested to know if there is any other way of accomplishing the work in question.

A Jig for Drilling Pins

ROBERT S. ALEXANDER

We had a large quantity of headed pins to make, such as the one shown at *A* in the sketch. Each pin was to have a $\frac{3}{16}$-in. hole near the end, the distance differing in certain pins. Not being satisfied with the amount of work drilled by ordinary jig methods, I devised the fixture illustrated, by the use of which production was greatly increased. The body is made of 2-in. square stock, one end being turned to fit the holes in the turret of a small hand-operated screw machine. A clearance hole for the drill, crossholes for holding two pins, and two tapped holes for setscrews completed the machine work. The holes for holding the pins are deeper than the length of the longest pin under the head and the tapped holes run into them. Setscrews are provided for the pins to bottom against, and can be adjusted so that the holes can be drilled at varying distances from the ends. Locknuts on the setscrews prevent their adjustment from being disturbed.



Piercing Heavy Stock With Small Punches

JOHN J. MCHENRY

There is, and always has been, a sort of accepted fact that to pierce stock having a thickness greater than the diameter of the punch required special construction of the tools. For such work, we either inserted hardened bushings in the strippers, or supported the punches by a hardened shedder, and complimented ourselves on having built a nice set of tools that worked well.

Recently, we had occasion to pierce some 0.115-in. holes in 0.156-in. hot-rolled stock. The old barrier of what could and what could not be done at once presented itself. However, we determined to ignore precedent and found it not only possible but practical to do the work in progressive tools of the ordinary type without supporting the punch in any way. Not the slightest trouble was experienced. The punch was 0.116 in. in diameter and the hole in the die 0.126 in. in diameter. The result was quite a break but a clean hole.

SEEN AND HEARD

JOHN R. GODFREY

Mops and Brooms

According to Edwin P. Norwood almost five per cent of the employees at the Ford River Rouge plant are hired to give battle to litter and dirt. To save time the workers are permitted to eat their lunches in the shop and very close to their work, but any litter disappears almost immediately the lunch hour is concluded. When going through a Ford shop not long ago with a foreman I was interested to hear him sharply reprimand a worker who had left a banana peel partly hidden under a piece of equipment. A clean shop tends to promote healthful conditions, and cleanliness goes hand in hand with precision. This, at least, is a part of the Ford philosophy, and it is reflected in a grade of work which, so far as limits are concerned, is rarely if ever achieved in production on a comparable scale. Upwards of five per cent of the Ford payroll seems like a lot to expend for cleanliness, but it evidently pays.

Saving on Finish Allowance

One of the old rules of patterns was to leave enough stock for the tool to get well under the scale, and from $\frac{3}{16}$ to $\frac{1}{8}$ in. was often found necessary to allow for distortion of castings, plus the scale. The use of T-C tools may effect a change in the amount of metal left for machining and save quite a tonnage in castings during a year. The density or hardness of the metal near the surface may also be a factor worth considering.

New Use for Old Cruisers

At last we have a way of making discarded warships serve a peacetime need. The Powell River Company in Vancouver has already used the old cruiser "Charleston" to act as a breakwater in their log pond to protect logs waiting to be chewed up into pulp, after which they will make newsprint paper for the world's enlightenment. Now the Powell company wants another cruiser, the "Huron," for a similar purpose. Hammering swords into plowshares has nothing on this.

Few Shops Are Large

Again we are reminded by recent statistics that we are a nation of small shops and that the huge factories employing thousands of men are the exception and not the rule. The large plants are so much in the public eye we get the impression they are typical of our industries. Statistics, however, show that only one-half of one per cent of our plants employ a thousand men or more, the great majority being well within the small shop range.

Lapping a Taper Plug

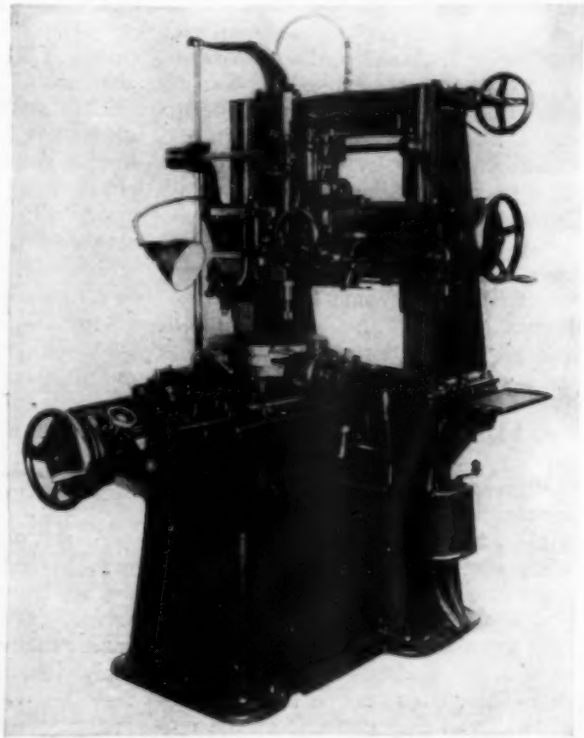
One of my friends wants to lap a taper bearing. Since one of the usual requirements in lapping plugs is to move the parts endwise he isn't sold on the idea of using a taper plug or socket as a lap. Without end movement you lose the correcting effect of bringing new surfaces into contact. He has a method in mind, but perhaps someone else has one that is better.

SHOP EQUIPMENT NEWS

Hauser No. 3½ Jig Boring Machine

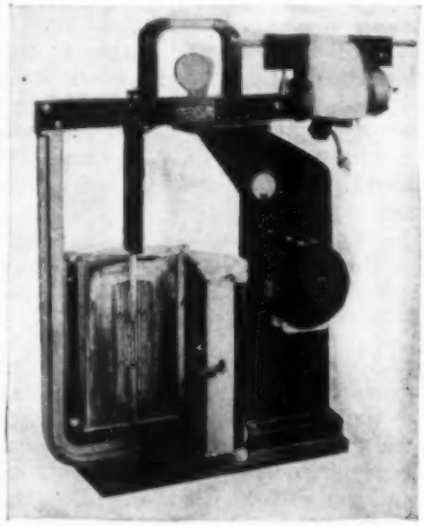
Several refinements and improvements not heretofore used on its jig boring machines have been embodied by Henri Hauser, Ltd., Bienne, Switzerland, in the No. 3½ jig boring machine. This machine is now marketed in the United States by the Index Machinery Corp., 49 Central Ave., Cincinnati, Ohio. The chief feature is the device whereby alignment between the crossrail of the machine, the boring spindle and the table is maintained at all times. This is accomplished by a series of hardened and ground locating blocks fastened to the two upright housings and upon which are suitable arms fastened to the crossrail rest, thereby taking the weight off the elevating screws as well as insuring alignment between the essential parts of the machine. To correct the errors remaining in the measuring screws even after careful lapping, the company has followed its usual practice of using long cams to correct the remaining errors. By this arrangement accuracy can be guaranteed to 0.00025 in. as the maximum error for the slide and table displacements. A special tool is provided for setting the axis of the boring spindle true with the axis of the circular table. The complete table is very compact. The drilling spindle runs in long hardened steel bearings, and is bored No. 2 Morse taper. The spindle can be fed either by hand or automatically, and three different and reversible feeds are provided. Drive to the spindle is taken through a clutch from a five-speed gearbox at the side of the machine. A 1½-hp. motor should be used for the drive, and if a two-speed design is selected, the five spindle speeds available can be doubled.

The range of this machine is as follows: Horizontal travel, 24 in.; transverse travel, 16 in.; working surface of the table, 26x16 in., with a maximum of 24 in. between the upright housings. When equipped with a two-speed motor, the machine has a range of spindle speeds from 50 to 1,500 r.p.m. Accessories are an automatic center punch, locating microscope, drill guide attachment for small drilling, boring tools with a maximum boring capacity of 4 in., centering device, 13¾-in. circular table, and a 12-in. universal tilting table. The weight is approximately 3,550 lb.



Rockwell Model LB Dilatometer

The Rockwell Model LB Dilatometer, combining the features of the former Model LA for securing critical transformations of metals during heating and cooling with accurate determination of coefficients of expansion, has been produced by The Stanley P. Rockwell Co., 296 Homestead Ave., Hartford, Conn. The Model LB allows the investigator to quench the work under study in any medium, and then secure the dilatometric-temperature curves of the work during the cooling range. This



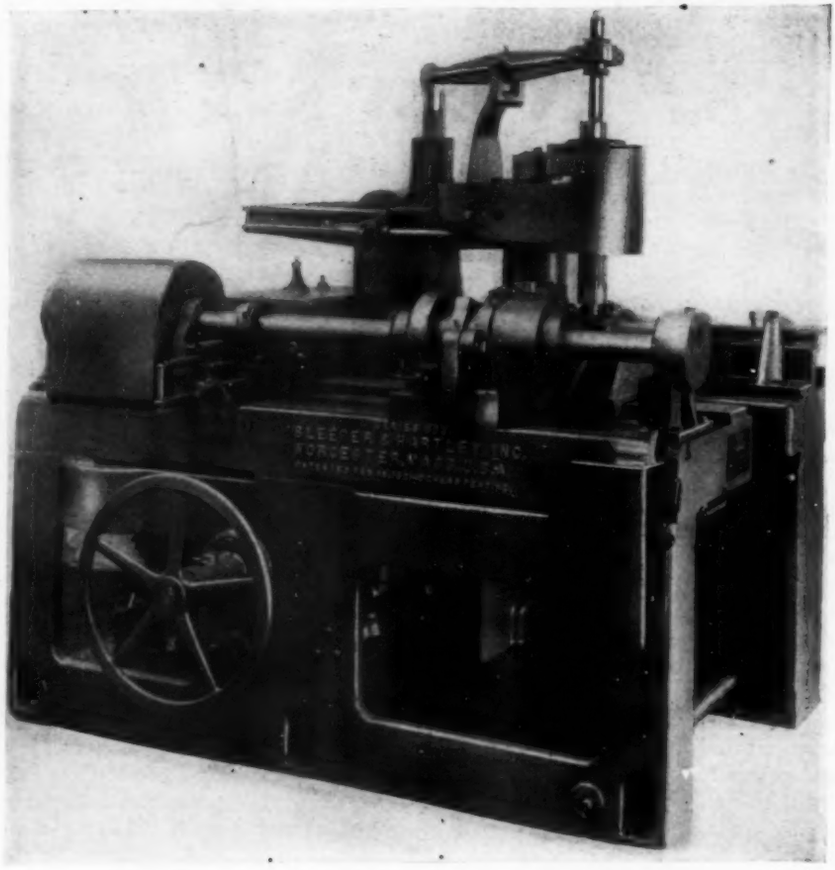
model has its field of usefulness in determining the proper heating rate to employ to control final shrinkage or expansion in the finished work, a field hitherto scarcely touched, according to the manufacturer. Its use in the investigation of various quenching medium rates is far more accurate than temperature tests alone.

Working parts are entirely of bell crank and gear drive construction. The chart drum is driven by a Telechron motor. Samples under test need no special preparation except for pyrometer fire end inlet hole if synchronous temperatures are desired. The pyrometer fire end passes down through a quartz feeler tube into the end of the specimen.

The equipment consists of 110-220 volt, a.c. or d.c., split-type, 3x12-in.,

vertical electric furnace, rheostat, ammeter, stand, Dilatometer with frame, dial, gear drive, recorder and iron constantan fire end, and all accessories such as chart paper, pen, ink and complete directions for setting up and uses.

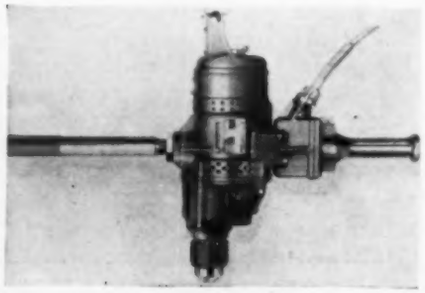
The unit is made principally of aluminum and requires no special form or shape of test piece, except that when temperatures are desired a $\frac{1}{8}$-in. hole must be drilled into the specimen. A quartz tube supports the work and an adjustable quartz tube holding a thermocouple contacts with the top of the sample to be tested. This upper quartz tube is connected to a dial and a gear-driven recorder. The dial is to note minute dilatometric changes down to 0.00005 in. The recorder, whose drum is driven by a Telechron motor, records the time-dilation curve. The furnace for heating has a working diameter of 3 in. and a length of 12 in. It is of the split type, so that at any instant of heating, or when it is desired to quench the work, it may be opened. The Rockwell Dilatometer as a whole, with its sample, is then lifted to the quenching bath.



"Thor" Drilling and Honing Machine

A combination drilling and honing machine, No. UFH, has been added to the "Thor" line of universal electric tools manufactured by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. The machine has ball bearings throughout and is designed to develop exceptional power and torque.

Drilling capacity is $\frac{7}{8}$ in., reaming capacity $\frac{9}{16}$ in., length over-all, 18 in. The spindle offset is $1\frac{3}{16}$ in., and weight, $25\frac{3}{4}$ lb. The drill can be had with a $\frac{5}{8}$-in. Jacobs chuck for drilling up to $\frac{3}{8}$ in., or for driving cylinder hone, or with the No. 2 Morse taper for drilling up to $\frac{7}{8}$ in.



Sleeper & Hartley No. 2½ Torsion Spring Winding Machine

Sleeper & Hartley, Inc., Worcester, Mass., have shipped a No. $2\frac{1}{2}$ torsion spring winding machine to the Autostroy-Doskino plant, in the U.S.S.R., where it will go into production work immediately. This machine has been developed because spring-makers both here and abroad have felt the lack of a torsion testing machine which would produce automatically springs of heavy wire with a large number of coils in the spring body at comparatively high speeds. This machine coils wire ranging from No. 14 (0.0800 in.) to $\frac{1}{4}$ in. In the smaller wire sizes it will produce springs with up to 50 coils at 20 springs per minute, while in the larger wire sizes, 25 coils may be wound into a spring at the rate of 10 springs per minute. Regardless of wire size, projecting ends up to 7 in. and 12 in. long may be left on either or both ends of the spring body, and in some cases these ends may be formed automatically as they come from the machine. Coils up to 4 in. in outside diameter may be produced.

This machine will find use in the automotive, agricultural implement, tractor and other plants. It occupies but 6 ft. by $4\frac{1}{2}$ ft. floor space. Nine major adjusting points assure accurate control of any feature of the spring dimensions. Anti-friction bearings are used extensively to provide ease of operation. The machine is motor-driven, the motor being mounted between the frames and out of the way of dust and dirt.

Toncan Iron Tin Plate

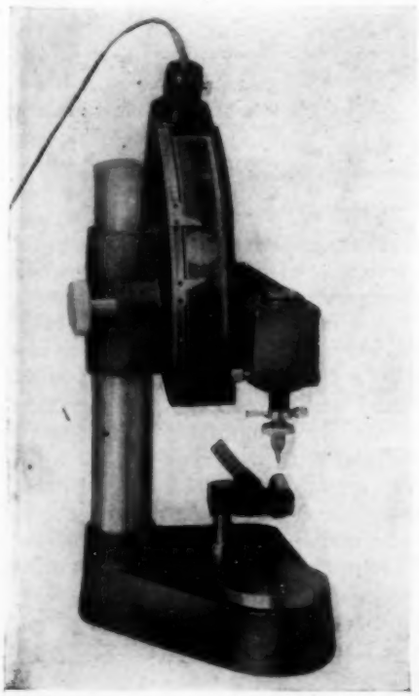
A tin plate with a rust-resisting base has been developed by the Republic Steel Corp., Youngstown, Ohio. The base material has the same analysis as Toncan copper molybdenum iron, and thus the plate may be used in many cases where ordinary tin plate would fail. Al-

though it is offered primarily for canning and food industries, there are various other applications. The Toncan Iron tin plate can be supplied in all base weights and sizes.

Zeiss Optotest Indicating Limit Gage

Accuracy of reading and high working speed are the features of the Optotest indicating limit gage announced by the George Scherr Co., 128 Lafayette St., New York, N. Y. This gage is manufactured by Carl Zeiss, Jena, Germany. The operating principle is that of translating the movement of a contact plunger into a corresponding tilting of a mirror, which reflects the image of a brightly lighted mark onto a large stationary scale graduated to 0.0001 in. and 0.00005 in. The instrument is provided with two adjustable limit hands, which are set to go and no-go limits, and is further equipped with an accurate scale of long range, namely plus or minus 0.005 in., reading directly to the above limits. The instrument is suitable for checking in mass production on go and no-go limits, and by using the scale, it will also sort parts for different fits as is necessary for selective assembly.

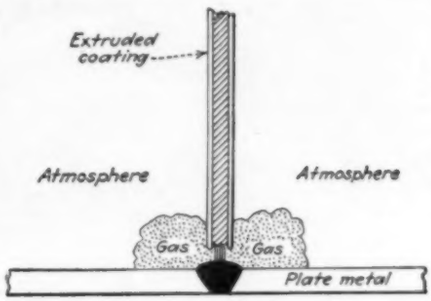
The Optotest comprises a wide foot with a circular table for the work, and a heavy upright column bearing a vertically adjustable housing with the gaging mechanism. Work up to 6 in. high may be placed on the table. Provision is made for an adjustable back stop for positively locating the work in measuring. The back stop has two crossing V-channels for receiving spherical-end standards and similar parts for alignment in the measuring axis.



Fleetweld Improved Coated Electrode

An improved, heavily coated electrode for welding within the shielded arc on mild steel is being produced by The Lincoln Electric Co., 12,818 Coit Rd., Cleveland, Ohio. Like its predecessor, this electrode will be known commercially as "Fleetweld."

The new electrode, as compared with the old, insures a higher ductility of weld metal, 20 to 30 per cent elongation in two inches. The tensile strength of coupons is increased about 10 per cent to average between 65,000 and 80,000 lb. per sq.in. High resistance to corrosion



is also noted. The electrode is claimed to have little "spattering." An accompanying illustration showing a bend test for ductility shows elongation in outer fibers of 43 per cent in a butt weld in two steel plates.

The shielded arc process, illustrated in any accompanying diagram, utilizes a heavy coating on the outside of an electrode of mild steel of proper specifications. This coating, burning in the arc less rapidly than the electrode melts, forms in effect a crucible around the arc, protecting it for almost its entire length. As the coating burns it gives off the shielding gas which prevents oxygen and nitrogen in the ambient atmosphere from reacting with the molten metal, thus improving ductility, tensile strength and resistance to corrosion as well as avoiding porosity.

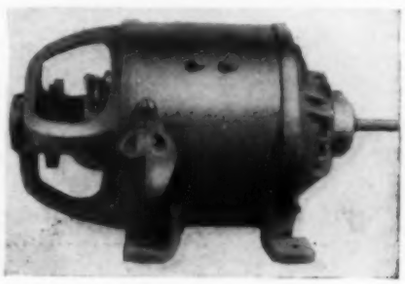
The new Fleetweld requires high welding current and allows higher

Ductility of a weld with the new Fleetwood rod having an outer fiber elongation of 43 per cent

welding speeds. The manufacturer claims speeds 2 to 4 times greater than those secured by bare or lightly coated electrodes. The coating is of special composition, and the core is produced to rigid specifications. The electrode will be produced in diameters from $\frac{1}{8}$ to $\frac{3}{8}$ in. and in two lengths, the standard 14 in. and the special 18 in. As with other Lincoln electrodes, Fleetweld is packed in square metal protective containers.

Reliance Small D.C. Motors

The Reliance Electric & Engineering Co., 1088 Ivanhoe Road, Cleveland, Ohio, has developed a line of small d.c. motors to supplement its larger Type T heavy-duty motors. These small motors are built in sizes from $\frac{1}{2}$ hp., 1,750 r.p.m. to 3 hp., 1,750 r.p.m. for constant- or adjustable-speed operation. They are constructed to withstand hard service and are provided with ball or sleeve bearings, and may be had in open,



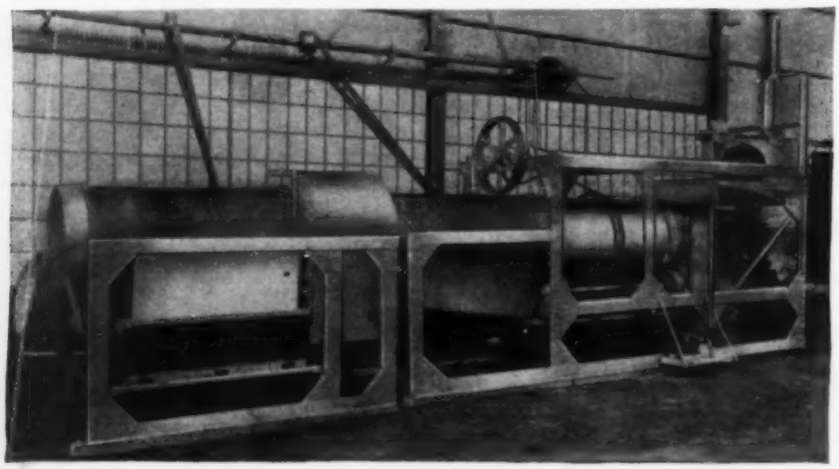
semi-inclosed or fully-inclosed models. Windings are given a finishing coat of bright orange-colored enamel to make it easy to detect and remove dirt.

A feature of these small motors is the refillable-type commutator. If the copper bars become damaged or badly worn, they may be removed easily and replaced.

Ransohoff Pickling Equipment

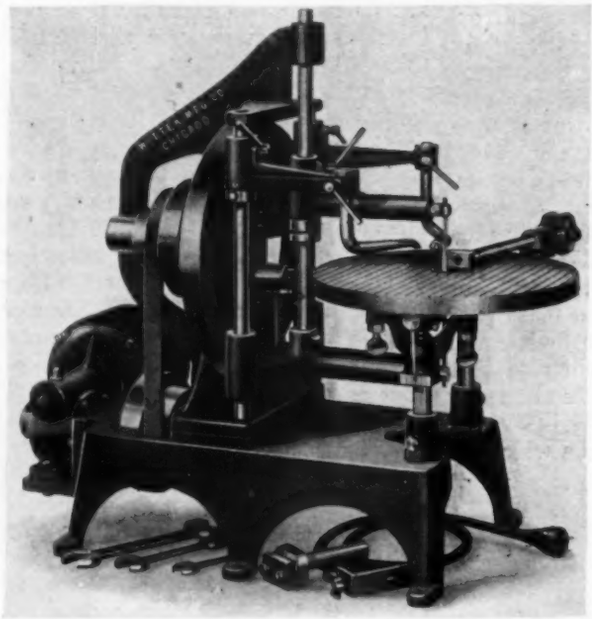
For pickling drop forgings, stampings and pole line hardware, N. Ransohoff, Inc., Cincinnati, Ohio, has developed the pickling equipment illustrated. Work up to 24 in. long can be handled, and soft threaded work is processed without damage to the threads. The work is brought to the machine in standard tote boxes and charged into the first unit of the assembly by a crane. This drum is lined with a rubber "Triflex" lining $\frac{9}{16}$ in. thick and vulcanized to the shell. The drum rotates at 6 r.p.m. to agitate the work gently in a flowing bath of sulphuric acid. The work is held in this drum until pickling is completed, and is then discharged into a screen section where it is drained.

In the third section, made of Everdur, the work is subjected to a spray from city water lines and then passes to the fourth section, also made of Everdur, where it is drenched with a fluxing solution of zinc chloride or muriatic acid. It is then discharged onto the hot plate for drying. The equipment saves labor, time and acid, and adds to the efficiency of the subsequent galvanizing operation.



Wittek Universal Die Sawing and Filing Machine

A universal die sawing and filing machine, designed to meet the varied requirements in the sawing and filing of dies, punches, templets, gages, or irregular shapes, whether of metal, fiber, Bakelite, or any material that can be sawed and filed, has been placed on the market by the Wittek Mfg. Co., 4305 West 24th Place, Chicago, Ill. The machine has a stroke adjustable from $1\frac{3}{4}$ to $5\frac{1}{4}$ in. with three possible speed variations, approximately 75, 150 and 300 strokes per min. The upper arm holder for the saw or file is adjustable vertically to hold files or saws up to 10 in. in length, and will also swing out of the way entirely clear of the table when short files are being used.



Stroke variation from $1\frac{3}{4}$ to $5\frac{1}{4}$ in. and three speeds are features of this Wittek Universal Die Sawing and Filing Machine

The file and saw holders are universal and quickly detachable to hold any kind of saw or file. When using short standard filing machine files, the top holder is swung to one side clear of the table and the file is held only with the lower holder. Adjustable hold-downs are provided which also swing out of the way. Two adjustable roller guides, one above and one under the table, hold and guide the saw for accurate cutting, giving correct finish. A split collar adjustment is provided for vertical adjustment of the upper holding arm to tighten the saw or light files to the correct tension.

The table is adjustable at an angle in any direction for sawing or filing clearances in all positions. It is also adjustable up and down to accommodate thick stock and to use maximum stroke. The screw feed is adjustable to any point on the circumference of the table, or may be removed by taking off one wing nut. The flywheel is balanced for smooth running, and also serves as a handwheel when making adjustment in inserting saws or files. Frame castings of the machine are Meehanite, an alloy of double the strength of semi-steel, securing greater strength with less weight.

The machine is available in four models: Bench model, belt driven, with a tight and loose pulley; bench model with motor and speed reducer drive; floor model mounted on a pedestal with tool rack and equipped with a motor and speed reducer drive, and floor model same as above with tight and loose pulley for belt drive. The machine illustrated is a bench model with a motor drive.

A complete line of saws and files for this machine is stocked by the company.

Wright Model 30 Screw Hoist

The Model 30 hoist, developed by the Wright Mfg. Co., Bridgeport, Conn., is lighter, more compact and approximately 15 per cent more efficient than the ordinary screw hoist, according to the manufacturer. It is recommended for general repair work and is adaptable for work on the horizontal, such as moving heavy loads on rollers or skids.

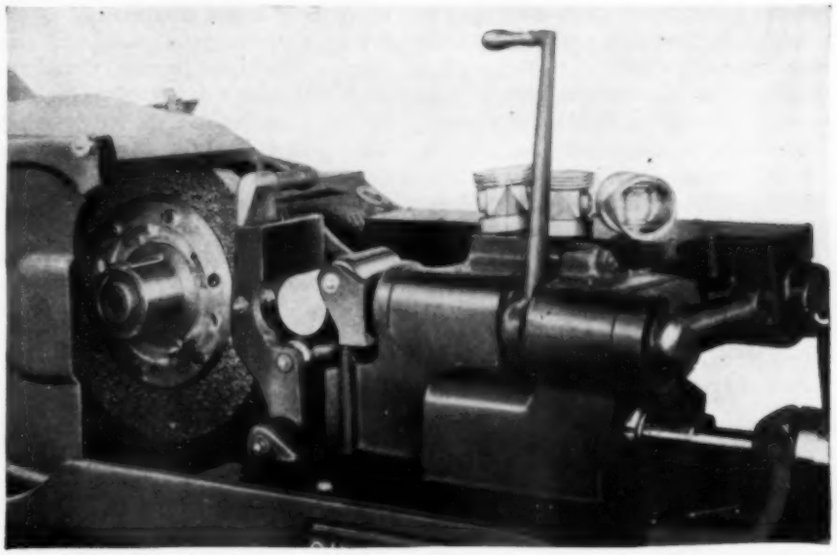
The hoist is designed on the worm-wheel principle, has few parts, and holds the load securely at any point. Features include: special analysis steel load chains, electrically welded, heat-treated and proof-tested; heat-treated, drop-forged hooks; load chain guards shroud the complete upper half of the load wheel and prevent the load chain from riding out of the load wheel pockets, and non-fouling hand chain guides.

Cincinnati Centerless Grinder for Relieving Pistons

A modified centerless grinder for finishing four reliefs on pistons at a fast production rate has been developed by Cincinnati Grinders, Inc., Cincinnati, Ohio. As illustrated, this special work-holding and driving unit replaces the regulating wheel housing and upper and lower slides of the Cincinnati No. 2 Centerless Grinder.

The piston is placed on a mandrel and is rotated by a floating driver. Downward movement of the operating lever engages a clutch which transmits drive to the work. The piston is supported by three sets of rollers and, as the operating lever is brought down, the upper roll at the right brings the work forward to its pivoting support and exerts the proper pressure on the feed for grinding. A cam, which provides an oscillating movement to the work for grinding the relief portions, is also actuated by the downward lever movement. Work rotation is timed with the cam so that the piston is relieved correctly. After reliefs are ground, the operating lever is raised, thus stopping the cam-controlled work oscillation and disengaging the work-driving clutch.

With a 0.003-in. stock removal, five pistons are relieved per minute by this method. Besides piston relief finishing, it can also be applied to a large variety of cam-shaped work.

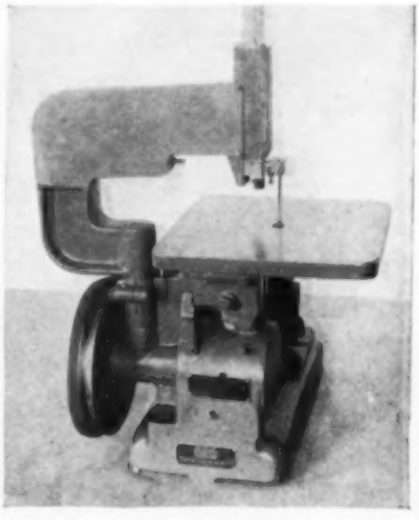


Four reliefs on pistons are finished rapidly on this modified Cincinnati Centerless Grinder, which may also be applied to cam-shaped work

Oliver Die-Making Machine

A completely redesigned die-making machine has been announced by the Oliver Instrument Co., Adrian, Mich., including many improvements. It can be furnished for motor belt drive, direct motor drive, belt drive and for small pedestal mounting, the Type S-4 shown being a motor belt driven type arranged for bench mounting.

The table of the new model is of heavier construction, rigidly supported on two brackets and tiltable in four directions, the working surface being accurately ground. The overarm is used for both filing and sawing, the upper end of the file or saw being clamped to a ram which reciprocates in rigid bearings. The upper tool steel ram is actuated through a bell crank lever and a heavy coil spring which provides uniform tension on the saw. The overarm may be swung away from the file to remove the die for inspection and may be brought back to the proper position instantly when filing is resumed. It is not necessary to remove the file or loosen it in the lower clamp to inspect the die. This new overarm eliminates the need of the hold-down brackets, fingers and file rollers required on previous models. Hold-down fingers are attached directly to the overarm and the working surface



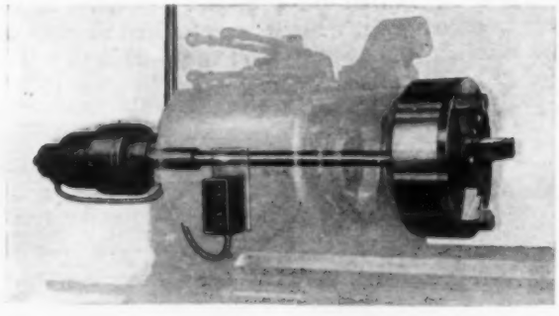
of the table is entirely clear. The machine is provided with an entirely new type of chuck consisting of a solid and a movable hardened jaw, brought together by means of a screw. The chuck on the lower ram and the one on the upper ram are accurately in line. The same chuck is used for holding saws, files and lapping sticks.

Union Electric Power-Operated Chuck

An electric power-operated chuck of the drawbar wedge type for outside and inside chucking has been developed by the Union Mfg. Co., New Britain, Conn. Features of this chuck are reduced operating costs; more work with lower upkeep, and greater range of jaw pressure. A push button is depressed until the jaws of the chuck grip the work, the approximate chucking time being 1½ seconds. The jaw pressure can be increased or decreased to suit the work. Current consumed is negligible, since the motor consumes current only for the time required to grip or release the work.

The power-operated chuck is adapted to any type of machine. Any air-operated chuck can be electrified without discarding the original air-chuck. The wedge type power chucks only are also furnished separately for air or hydraulic pressure.

The chuck is of steel throughout



and the combined bottom jaw movement is ¾ in. Hardened adjustable step-along-top jaws are provided. The one-piece hardened steel face is firmly attached to the body. The high-torque motor is 6¾ in. in diameter for small chucks and 8 in. in diameter for chucks of 12 in. or over. The reducing gear unit embodied in the housing with the motor is balanced and is made in two sizes for small and large size chucks. Gears are of chrome nickel steel and hardened. The heat-treated drawbar is provided with a large diameter Acme thread. Drawbar pulls ranging from 20,000 to 40,000 lb. are available, according to the size of the chuck.

Besides the equipment illustrated a control box for the jaw pressure is provided. This control box has four pressure stations by which it is possible to secure a low pressure, ½-jaw pressure, ¾-jaw pressure and high jaw pressure. Station No. 1 provides jaw pressure for second operation work; station No. 2 provides jaw pressure for all ordinary work; station No. 3 provides jaw pressure for multiple tool cutting, and station No. 4 provides jaw pressure for extreme holding power. A reversing switch is provided for either outside or inside holding.

Union Special Carburizing Steel

A special carburizing steel, which will not develop soft spots when case-hardened, has been developed by the Union Drawn Steel Co., Beaver Falls, Pa. With a straight carbon steel it has been found that the introduction of correct proportions of manganese and silicon, keeping these in proper relation to the carbon content, will produce a steel free from any tendency toward soft spots when carehardened and one that has exceptional physical properties, such as resistance to wear in the case combined with toughness and ductility in the core. The chemical specifications are as follows: Carbon, 0.10 to 0.20 per cent; manganese, 0.60 to 0.90 per cent; phosphorus, 0.04 per cent maximum; sulphur, 0.05 per cent maximum, and silicon from 0.20 to 0.30 per cent. The manganese and silicon contents are higher than in the SEA-1015 or SAE-1020 types of steel, as it has been found that manganese and silicon in these proportions give a dense, homogeneous steel and one which responds readily to casehardening heat-treatments. A low sulphur content acts to produce the best carburized parts, and the steel should not be confused with the high-manganese, screw-stock type of carburizing steel. Automatic screw machine tests of the machining properties of this special steel have shown it to machine more satisfactorily than either SAE-1015 or 1020. Slightly higher surface speeds are possible and a better finish was obtained than on the regular grades. It was particularly superior on threading and drilling operations.

The various properties obtained from test on ¾-in. round bars are as follows: ultimate strength, cold drawn, 97,190 lb.; when quenched from water, 1,600 deg. F., 110,250 lb.; when quenched from water, 1,400 deg. F., 110,950 lb.; and double quenched at 1,600 and 1,400 deg. F., 107,150 lb. The Brinell hardness was as follows on a ¾-in. round bar: At the center, when quenched, 1,600 deg. F., 228; when quenched, 1,400 deg. F., 207; double quenched, 1,600 and 1,400 deg. F., 202; hardness at the surface, cold drawn, 183; quenched, 1,600 deg. F., 375; quenched, 1,400 deg. F., 241; double quenched, 1,600 and 1,400 deg. F., 241.

"Sturaco" Gear Lubricants

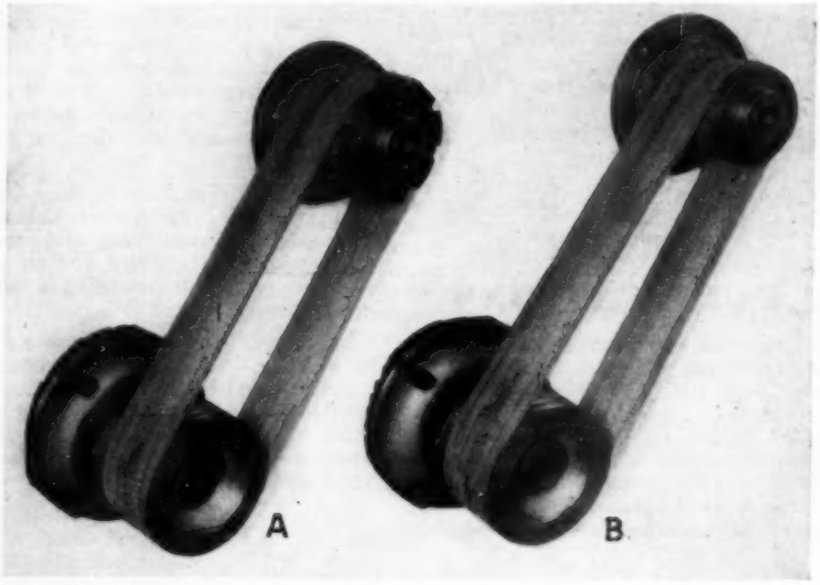
Sulphurized oils and greases, which have been developed by D. A. Stuart & Co., 2727-2753 South Troy St., Chicago, Ill., offer 100 to 500 per cent more load carrying capacity than the usual gear lubricants on the market. These "Sturaco" products are known as S.A.E. extra-pressure lubricants and are available in either oil or grease forms to range in viscosity from S.U. 100 sec. at 100 deg. F., to 350 sec. at 210 deg. F., with a pour test for the lower viscosities as low as minus 40 deg. F. These lubricants are made in a sufficient range of properties to be suitable for high-speed spindle lubrication, bearing lubrication and for use in speed-reducing and other gears. They were developed because automotive and machinery manufacturers were faced with the possibility of not realizing improvements and economies made possible by newly designed high-speed, heavy-duty gears and bearings or obtaining a lubricant with a minimum of 100 per cent greater load-carrying capacity to prevent metal seizure under operating conditions of

high rubbing speeds and heavy loads. A complete line of gear lubricants and greases is now available for automotive service, and also a complete line of lubricating oils for mill use.

Hammond Variable-Speed Pulley

A variable-speed pulley capable of transmitting up to 15 hp. has been developed by Hammond Machinery Builders, Inc., Kalamazoo, Mich. This pulley has a ratio of 1½ to 1, and it is possible to secure an unlimited number of speeds in this ratio. The maximum revolutions per minute recommended is 3,000 r.p.m.

This variable-speed pulley can be used with V-belts, and takes up very little additional room over that of the ordinary V-belt pulley or sheave. In the accompanying illustration *A* shows the motor and pulley, but with the variable-speed pulley expanded, to operate the spindle at a speed of 2,000 r.p.m. In the same figure *B* shows the variable-speed pulley in the closed position.



This variable-speed pulley was originally developed for use with polishing, buffing, and grinding machines manufactured by the above company. For these drives any speed from 2,000 to 3,000 or 1,800 to 2,700 r.p.m. can be supplied, and only two minutes is required to change from one speed to another. On high-speed grinders for snagging work, the wheel peripheral speed must be maintained as the wheel wears. With this pulley as part of the equipment a speed range of 1,600 to 2,400 r.p.m. is supplied for 24-in. wheels. The speed may be changed so that constant peripheral speed of the wheel is secured until it is worn down to 13 in. in diameter.

Carpenter Special Tough Carbon Tool Steel

Special tough carbon tool steel is being marketed by The Carpenter Steel Co., Reading, Pa., after being subjected to a hot acid etch test and also a "timbre" test. Each batch of steel is tested in the billet for both conditions. The hot acid etch test reveals that there is no injurious pipe, slag, dirt, segregation, center cracks or other material defects. The timbre test shows whether the steel will crack in hardening, and assures the same penetration of hardness, the same freedom from soft spots, and the same expansion or contraction in all lots. This special steel is not overheated when quenched from 1,550 deg. F., which prevents cracking in hardening or checking during grinding.

The No. 11 special steel, which is offered for fine tools, contains 1.10 per cent carbon and is a water-hardening type tool steel. The hardening temperature is 1,425 deg. F. It is annealed by a process which makes for clean machining, particularly on delicate backing-off operations and similar precision work. It is offered for blanking and forming dies, punches, hobs, milling cutters, form cutters and other tools. Any hot-rolled size required may be obtained directly from warehouse stock, and the steel is also available in cold-drawn or ground bars, and forged rings, disks or die blocks.

Other tempers of this special steel are made in Nos. 6 to 13. No. 6 has a carbon content from 56 to 65 per cent, and No. 13 from 1.26 to 1.35 per cent.

Trichlorethylene

The Roessler & Hasslacher Chemical Co., Inc., Empire State Bldg., 350 Fifth Ave., New York, N. Y., after field trials, is now offering generally a chemical known as trichlorethylene. This liquid is heavy and colorless and possesses a pleasant odor. It boils at 188 deg. F., is not flammable or explosive, nor does its vapor form combustible or explosive mixtures with air. It is a solvent for oils, fats, greases, waxes, tars, gums, rubber and many resins. It is not a solvent for cellulose acetate, although mixtures of trichlorethylene and alcohol can be used as solvents for this class of material.

Trichlorethylene is particularly valuable in the metal-working industries for degreasing of metals. A chemically clean surface is essential in order to produce good finishing in painting and plating work. One unit on the market, known as the "Vapor Degreaser," makes use of this material. In this unit the trichlorethylene is boiled and vaporized, the objects to be degreased being suspended in the vapor in the tank. The vapor immediately condenses on the cold surfaces of the metal and runs off profusely, carrying away all traces of grease. The suspended objects reach the temperature of the vapor in from ½ to 3 min., depending on the weight or gage of the metal. By this time the objects are completely degreased and may be removed at once in a dry state. The vapors are condensed and returned as a liquid to the bottom of the tank. Vapors from the material are heavier than air and are not ordinarily dangerous to workmen, but usual precautions should be taken.

PATENTS

SEPTEMBER 29, 1931

Metal-Working Machinery

Drill Head Safety Mechanism. William C. De Roo, Cincinnati, Ohio, assigned to The Fosdick Machine Tool Co. Patent 1,824,984.

Machine for Expanding Cylinders. Harold G. Vaughn, Warren, Ohio, assigned to The Ohio Corrugating Co. Patent 1,825,030.

Mechanical Movement. Alfred E. Drissner, Cleveland, Ohio, assigned to The National Acme Co. Patent 1,825,056.

Revolving Holder Machine Tool. George E. Hallenbeck, Toledo, Ohio, assigned to Baker Brothers, Inc. Patent 1,825,060.

Machine for Expanding Cylinders. George G. McKay, Youngstown, Ohio, assigned to The Ohio Corrugating Co. Patent 1,825,081.

Gear Generating Machine. Eyvind Finsen, Rochester, N. Y., assigned to Gleason Works. Patent 1,825,112.

Automatic Screw-Threading Machine. Jean Francois Arnold, Paris, France. Patent 1,825,171.

Electrically Operated Column Clamp for Radial Drills. William C. De Roo, Cincinnati, Ohio, assigned to The Fosdick Machine Tool Co. Patent 1,825,181.

Centrifugal Molding Apparatus. William H. Beatty, Birmingham, Ala., assigned three-eights to W. Henry Beatty. Patent 1,825,302.

Polishing and Grinding Machine. Charlie L. Hawes, Ashtabula, Ohio. Patent 1,825,455.

Cutting and Welding Machine. Adam Schmidt, Strebersdorf, Austria, assigned to the Firm Aktiengessellschaft fur Tiefbohrtechnik und Maschinenbau vormals Trauzl & Co., Vienna, Austria. Patent 1,825,606.

Tools and Attachments

Centering Device for Lathes. Edwin Natanael Broden, Roxbury, Mass. Patent 1,824,769.

Chuck Operating Mechanism. Alfred E. Drissner, Cleveland, Ohio, assigned to The National Acme Co. Patent 1,824,878.

Percussion Mechanism for Tools. George Henry Thompson, Selly Oak, Birmingham, England. Patent 1,824,935.

Tool Holder. Benjamin T. Browand, Cleveland, Ohio. Patent 1,825,046.

Adjustable Die. Walter C. Johnson, Jamestown, N. Y. Patent 1,825,067.

Machine for Riveting Lugs to a Tire Carrying Rim. William N. Booth, Detroit, Mich., assigned to Kelsey-Hayes Wheel Corporation. Patent 1,825,175.

Apparatus for Forming Spoke Holes in Rim Members of Vehicle Wheels. Dwight E. Copple, Detroit, Mich., assigned to Kelsey-Hayes Wheel Corporation. Patent 1,825,180.

Gage for Sheet Metal Punching Machines. Gordon Ray Walts, New Albany, Ind. Patent 1,825,563.

Processes

Process of Heat-Treating Metal. James J. Bowden, Warren, Ohio. Patent 1,824,865.

Pickling of Stainless Steel. Nathan H. Schermer, Youngstown, Ohio. Patent 1,824,932.

Method of Treating Metals and Treating Agent Therefor. Frank J. Wilson, Alturas, and Alan S. Evans, Los Angeles, Calif.; said Wilson assigned to said Evans. Patent 1,825,565.

Process of Producing Castings of Magnesium and High Grade Magnesium Alloys. Albert Levy Mond, London, England, assigned to I. G. Farbenindustrie Aktiengesellschaft, Frankfort-on-the-Main, Germany. Patent 1,825,242.

Furnaces

Furnace. Walter Grothe, San Leandro, Calif., assigned to Caterpillar Tractor Co. Patent 1,825,059.

Furnace Conveyor. Raymond J. Wean, Warren, Ohio, assigned to The Wean Engineering Co. Patent 1,825,107.

Annealing Furnace. Henry Alinder and Grant B. Shipley, Pittsburgh, Pa., assigned to The International Nickel Co. Patent 1,825,380.

TRADE PUBLICATIONS

CYANIDES AND SALTS. The Roessler & Hasslacher Chemical Co., Inc., Empire State Bldg., 350 Fifth Ave., New York, N. Y., has issued a booklet entitled "R&H Cyanides and Salts for Case Hardening and Heat-Treatment of Steel." The various forms in which these materials are available are given and their use in heat-treating operations.

DIE-CASTINGS. The New Jersey Zinc Co., 160 Front St., New York City, has issued a booklet entitled "Zinc Die-Castings," which pictorially presents the advantages of zinc-base die-castings in a wide variety of products ranging from business machines to novelties and toys. A considerable number of products are illustrated. Properties of die-cast Zamak-2 are appended.

DIE STEELS. The Jessop Steel Co., Washington, Pa., has issued a new catalog on cold working die steels, combining all material in one instead of by means of different leaflets.

FLEXIBLE COUPLINGS. The Morse Chain Co., division of Borg-Warner Corp., Ithaca, N. Y., has issued bulletin No. 47 on its flexible couplings, describing the features of these products, how to select them, horsepower curves, dimensions and prices, and installation views. The booklet is illustrated throughout with unusually good photographs and line drawings, and presents the material in an easily readable form.

LIFT TRUCKS. The Elwell-Parker Electric Co., Cleveland, Ohio, has issued a rotogravure catalog entitled "Engineering Electric Trucks to Fit Your Job," which illustrates, with over 60 photographs, difficult handling jobs in many lines of industry and describes pictorially various applications of electric trucks as designed for special handling jobs.

MECHANICAL RUBBER GOODS. The Diamond Rubber Co., Inc., Akron, Ohio, has published a new edition of its mechanical catalog, which describes new items recently brought out, as well as standard items.

POTENTIOMETER PYROMETERS. The Brown Instrument Co., Philadelphia, Pa., has issued a new 16-page booklet on the new Brown potentiometer pyrometer, which explains and illustrates the principal features and gives special reference to the accuracy of operation and study construction. Each feature is generally illustrated by means of a half-page illustration and described below. The booklet gives a quick resumé of the most outstanding features of the more than fifty new ones embodied in this instrument.

SWITCHES. The Allen-Bradley Co., Milwaukee, Wis., has issued Bulletin 715 on automatic multi-speed across-the-line switches, and Bulletin 742 on an automatic increment starter for network systems.

TOOL STEEL. The Carpenter Steel Co., Reading, Pa., has issued a bulletin entitled "Tough Carbon Tool Steel," describing the features of its line of special tough carbon tool steels of the water-hardening type and giving complete treating instructions.

WELDED STEEL GEARS. Lukenweld, Inc., division of Lukens Steel Co., Coatesville, Pa., has issued a booklet entitled "Welded Steel Gears from Blanks of Lukenweld Construction," showing the manner of fabricating these welded steel gears and the various advantages.

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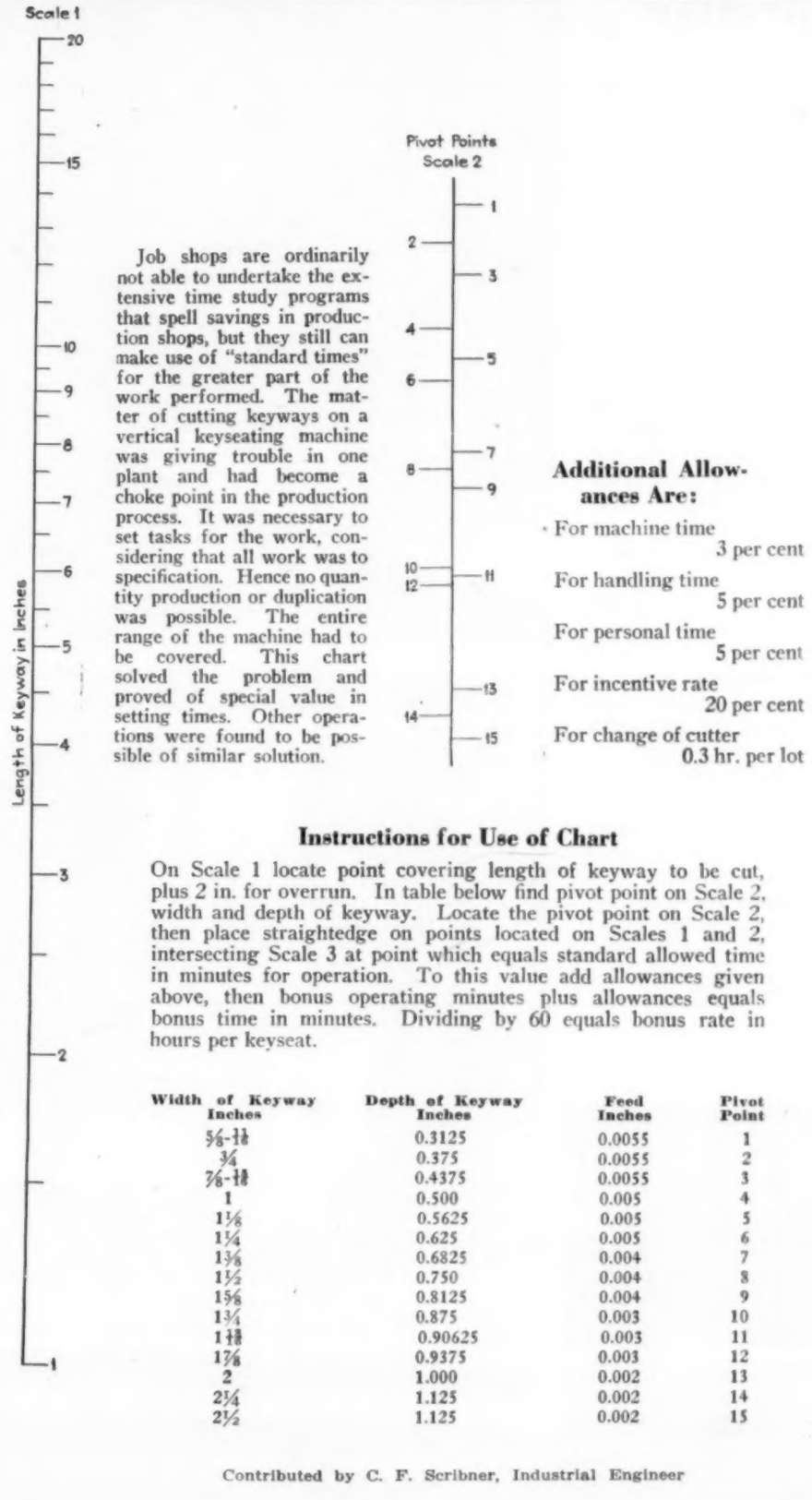
Trigonometric Solutions for Triangles—*Correction*

PERCY GRAFTON

Four formulas in the above-titled Reference Book Sheet (*AM*—page 509, Vol. 75) are incorrect, probably due to a misprint. Thus, in the four formulas in the right-hand column, beginning with the second from the top, the numerators of the right-hand members include a *C*. These should instead be *c*.

STANDARD TIMES FOR CUTTING KEYWAYS



Job shops are ordinarily not able to undertake the extensive time study programs that spell savings in production shops, but they still can make use of "standard times" for the greater part of the work performed. The matter of cutting keyways on a vertical keyseating machine was giving trouble in one plant and had become a choke point in the production process. It was necessary to set tasks for the work, considering that all work was to specification. Hence no quantity production or duplication was possible. The entire range of the machine had to be covered. This chart solved the problem and proved of special value in setting times. Other operations were found to be possible of similar solution.

Additional Allowances Are:

For machine time — 3 per cent
For handling time — 5 per cent
For personal time — 5 per cent
For incentive rate — 20 per cent
For change of cutter — 0.3 hr. per lot

Instructions for Use of Chart

On Scale 1 locate point covering length of keyway to be cut, plus 2 in. for overrun. In table below find pivot point on Scale 2, width and depth of keyway. Locate the pivot point on Scale 2, then place straightedge on points located on Scales 1 and 2, intersecting Scale 3 at point which equals standard allowed time in minutes for operation. To this value add allowances given above, then bonus operating minutes plus allowances equals bonus time in minutes. Dividing by 60 equals bonus rate in hours per keyseat.

Width of Keyway Inches	Depth of Keyway Inches	Feed Inches	Pivot Point
5/8-11/16	0.3125	0.0055	1
3/4	0.375	0.0055	2
7/8-13/16	0.4375	0.0055	3
1	0.500	0.005	4
1 1/8	0.5625	0.005	5
1 1/4	0.625	0.005	6
1 3/8	0.6825	0.004	7
1 1/2	0.750	0.004	8
1 5/8	0.8125	0.004	9
1 3/4	0.875	0.003	10
1 13/16	0.90625	0.003	11
1 7/8	0.9375	0.003	12
2	1.000	0.002	13
2 1/4	1.125	0.002	14
2 1/2	1.125	0.002	15

Contributed by C. F. Scribner, Industrial Engineer

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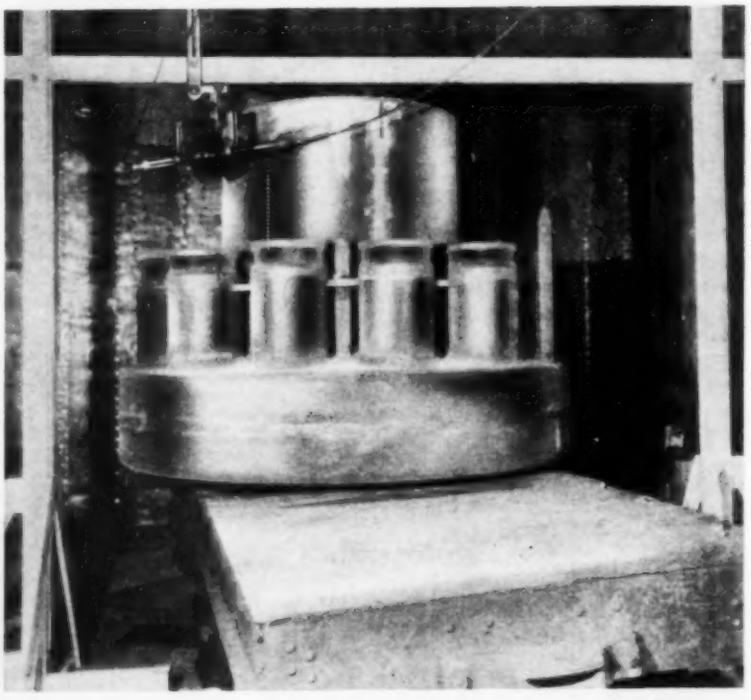
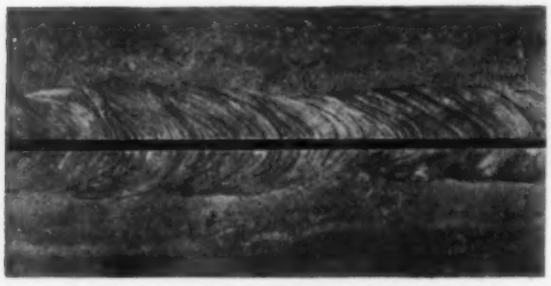
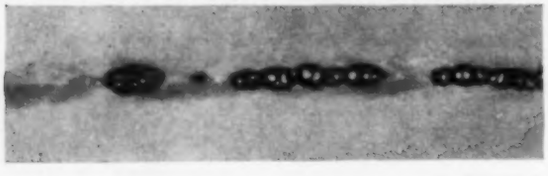
Industry's Intro-inspective Eye

NEWEST and largest of industrial X-ray laboratories is that of General Electric at Schenectady, completely equipped with substation, two X-ray rooms, photographic darkroom, and air-conditioning plant. The larger room is 24x16x17 ft. high, the smaller is 11x11x9 ft. high. Both are $\frac{1}{8}$-$\frac{1}{4}$-in. lead-lined. Unusual equipment includes a stereoscopic viewing apparatus which permits operators to "look into" a piece being inspected if two photographs of the piece, taken with lenses at eye distance apart, are placed within it. The laboratory is used for inspecting castings, welds, forgings, incoming raw materials, finished products—even to aid in repair. A crankshaft, internally lubricated, was causing trouble. X-ray examination showed that one oil channel was not sufficiently deep to join another. Likewise the X-ray examines assemblies, compares welds by different processes, studies motor bearing assemblies, and inspects salvaged parts. The smaller radiographic room [top] has X-ray equipment with standard hospital therapy mounting. That in the larger room [right] has an overhead suspension system and uses a 200,000-volt deep therapy tube. Usual exposure is 5 min. at low voltages, thus providing more contrasty pictures. Operators watch through lead-glass windows. A weld that looked sound, on X-ray photograph of it, and the edges when the weld was cut through, revealing the defects indicated by the X-ray, are also shown.







AMERICAN MACHINIST

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

New York, October 8, 1931

VOL. 75 No. 15

Cause or Effect

In one of his thoughtful Washington letters Mark Sullivan pointed out recently that many citizens are mixing cause and effect when they anticipate dull business because dividend reductions are the order of the day. Perhaps it is natural for one to see the future through a blue haze if his personal income has been seriously impaired by reduction of salary, of income from investments, or of both.

But reduction of dividends now may be the best insurance for resumption of dividends later. Whether we are willing to admit it aloud or not, most of us are well aware that wastes in the conduct of all kinds of businesses were alarmingly large two years ago. It was evident to a few that a day of reckoning was sure to come, but to the many the future was as rosy then as it is indigo now. Their reasoning then that high dividends meant continued prosperity was as dubious as their reasoning now that the reverse is true.

High dividends reflect a previous period of profitable activity. Low dividends result from a period of depression. Neither can be considered an augury of the future, except that any dividends now may be an indication that a company is purged of its wastefulness and ready to operate profitably during hard times.

Size and Dexterity

In most contests the fast big man has the edge. But when the fast little man is pitted against the slow big man there are games, and situations, where he may have somewhat more than an even break.

The same relation exists in business. The big company that is well organized, that conceals no dead wood among its executive timber, is almost unbeatable in the long run. If it is so big that control is difficult to concentrate, the story is different. An alert small competitor may often dash in and take orders away from it before it can get into action.

But even the fastest moving big corporation is likely to be slower in recovery from a depression than the good small company. One reason, of course, is that relatively few orders will look much larger to a small company than to a large one, and will show to better advantage on an activity percentage curve.

Two examples are before us now: the relatively better position of some of the small steel companies, and the higher standing of the small, "Class C" machine tool builders in the orders chart prepared by the National Machine Tool Builders' Association. The fact that the small companies experienced a rather pronounced improvement in August business should be a good sign that the larger ones will improve later.

Management Must Face the Issue

Every advance in machines for manufacturing increases quantity or improves quality or does both. Manufacturing costs are reduced to unbelievable figures; it is a commonplace that luxuries of past decades become everyday necessities. Yet some schools of thought are blaming machines for worldwide depression, and certain economists write plaintively of primitive civilizations where living conditions are simple and unemployment is no tragedy.

Any device that reduces the labor required for a given product can be likened to highly fertile land. With poor land the farmer may work ten hours a day to raise a scanty crop; on a fertile farm he will produce bountifully with eight hours or less. Yet none would advocate the abandonment of any fertile farm on that account. If it produced enough in one year to feed those dependent on it for two years, the farm hands could hardly be expected to go without working during

the second year. Some means would be found for spreading the work over the whole period.

Whether it be machines or extra fertile land that cause great increases in production, the problem of governing this production—with due consideration to the owner, the worker and the consumer — is one for management alone. The amount of product to be produced and its distribution are at present of greater importance than further reductions in production costs. The successful solution of management's problem would do more than anything else to restore that confidence which alone will start buying and restore prosperity.

◂◂ CHIPS ▸▸

Washington continues to mark time on national and international questions . . . The I.C.C. termintes its hearings on R.R. freight inreases . . . promises an early decision . . . probably thumbs down . . . President Hoover approves Eastern Rail Plan of the four major railroads . . . and the Stock Market sags some more points . . . Though the I.C.C. must still okay the plan, many of the necessary consolidations are already accomplished facts . . . Secretary Adams takes just ten minutes to thumb his New England nose at The Navy League and to propose that one fifth of the Navy fleet be laid up . . . Perhaps someone should say something to him about unemployment and the shops and yards servicing the Navy . . . Senator Hebert, chairman of the Senate committee investigating unemployment insurance, opposes the Swope Plan, and Calvin Coolidge does not choose not to support Herbert Hoover for renomination.

ONE WEEK LONGER

On the contents page for this issue appears the new address of *American Machinist*, 330 West 42nd Street, New York City. Though the new address is in all ways official, it is only fair to notify our friends and subscribers that certain considerations may cause us to remain one week longer at the old Tenth Avenue address.

A new low-priced six will invade the automotive field this fall or winter . . . name closely guarded, but George M. Graham, former vice-president of Willys-Overland, Chandler and Pierce-Arrow, is behind the project . . . Stainforth steps the airplane speed record up to 408.8 m.p.h. . . flew one lap at 415.2 . . . his vehicle a Vickers-Rolls Royce Supermarine . . . 2600 hp. engine designed to last one hour only . . . Motor and Equipment Association reorganization progresses . . . two Associations emerge —the Motor and Equipment Manufacturers' and the Motor and Equipment Wholesalers' . . . Move for national six-hour day and five-day week gains momentum . . . Manufacturing Chemists Association, the latest convert . . . Pangborn and Herndon and their Bellanca plane land safely at Wenatchee, Wash., after a 41-hr. flight from Sabishoro Beach, Japan . . . Annual Ordnance demonstration going full tilt at Aberdeen, Md., today.

Reported that small tool and die business in Detroit is exceptionally good . . . fact that Detroit industrial employment shows sharp increase may have much to do with it . . . Pennsylvania R.R. orders chassis and mechanical parts for sixty electric locomotives . . . Morse Chain receives encouraging automotive contracts and releases for timing sprockets and chains . . . August Copeland refrigerator business 43.7 per cent over August, 1930 . . . General Electric orders 48-in. x 16-ft. Cleveland openside planer . . . September bookings for Remington Rand are 6.5 per cent ahead of last year . . . Farrell Birmingham Company, Ansonia, books large order for machinery and forgings . . . Hendey secures cream of the seventeen-tool Brooklyn Navy Yard list . . . Scripps Motor Company's marine engine sales in August increased 150 per cent over 1930 . . . Chrysler shipments for September, for the third quarter, and for the year to date all exceed 1930 figures . . . Manufacturers exhibiting at the 1931 Radio Show booked over six million dollars in spot orders . . . Hupp and Auburn are about to place large orders for drilling machines . . . And bank clearings increased two hundred million dollars over last week.

All the world awaits the functioning of "France, Germany & Co." . . . France appears to be less sanguine than Germany . . . England calm and even optimistic . . . McDonald not so calm while he juggles his numerous national and personal problems . . . Difficult to see how he can duck a general election . . . Twenty-fifth annual Paris automobile salon opens . . . free-wheeling spreads . . . more color . . . wider, more comfortable bodies . . . greater attention to noise and vibration elimination . . . U.S.S.R.

opens the new Kharkov tractor plant and a Moscow automobile truck factory . . . capacities, 50,000 and 25,000 units per year respectively.

Details yet to be announced on the first Chinese motor truck . . . the Chung Shan . . . designed by D. F. Myers of these United States . . . American truck builders doubtless praying that Chung Shan will not sweep country like Mah Jong.

Col. Edward A. Simmons, publisher, manufacturer, transportation expert and patriot, passes on . . . For twenty years he had been president of the Simmons-Boardman Publishing Company, publishers of "The Railway Age" and other business magazines.

RIDE OR TALK

Unemployment relief begins at home. Although Gifford's Relief Committee has not yet hit its stride, measures are being taken with the A.T.&T. to increase employment or at least to prevent further layoffs. Part of the strategy is to make every member of the allied companies a salesman.

High-powered lecturers are doing their bit to furnish employees with ammunition whereby they can persuade friends to install additional phone service. Particularly is the fact stressed that motor cars outnumber telephones in the United States. And it costs less to say "Hello" than to go for a ride.

THIS WEEK IN *AM*

Behind the leading article in this issue there is even more background than usual. Not only did the author travel ten thousand miles for a first hand view of the Soviet experiment; he interviewed dozens of American engineers right on the job. As a matter of fact one of Mr. Carmody's major objects on the whole journey was the gathering of the information here compiled.

We are indebted to C. A. Hardy, consulting engineer, of Whiting Corporation, for "Neatness and Economy in a Small Foundry" (page 550). Anyone contemplating the erection of a new foundry or the revamping of an old one can do himself a good turn by heeding his mature suggestions. Canada is not the only place in the world where sand can be stored indoors to advantage.

Some time ago Earle Buckingham, of M.I.T., provided us with the results of careful research in "Spur Gear Teeth." You may recall that he mentioned certain experiments based on semi-steel gears. James Ferguson, of Hamilton, Lanarkshire, England, wanted to be sure that he understood correctly and wrote us. We asked Mr. Buckingham if he would be willing to supply the necessary information, and his reply is so interesting that we are publishing it in full (page 558).

Herbert Chase, author of "Automatics on Fine Instrument Parts" (page 565) will be remembered as a former associate editor of *American Machinist*. He is engaged in consulting engineering practice with headquarters in New York City. John Gaillard, who wrote "Hole Tolerances and Tool Manufacture" (page 559), is standardization engineer for the American Standards Association.

COMING

A promise is a promise, even though it happens to be a conditional one. Last week, with a certain reservation, we promised that we would publish an article which embodied both technical and human interest to a high degree. It is a pleasure and a relief, therefore, to be able to announce that it will appear next week as originally planned. Technically, it covers genuine advances in hydraulic metal forming; humanly, the author wishes to let it speak for iself.

In the same issue will appear an excellently illustrated article showing how one shop has taken advantage of forced leisure to provide itself with the best tool stands we have seen. Here will be found an example of "made work" that has made good. Other significant subjects to appear next week are "Tool Grinding Control," and an exclusive article on how a certain monorail conveyor simplified a complicated assembly line. Captain Walter Soderholm will complete his series on the modern set-up for ordnance materiel.

From Detroit came insistent reports of Chrysler's Plymouth car production. Immediately we asked a competent observer to spend enough time in the plant to get every highlight. His whole story will be put into print in *American Machinist* for October 22.

Several of our best informed readers have mentioned that certain fundamental shop arts have not been adopted as widely as their merit would warrant—swaging, for example. You will be interested to know that an article on that subject is in preparation, one editor having visited two swaging manufacturers during the past two weeks to secure the latest and best data. He has several more plant visitations to make, but the article will be worth waiting for.

THE . INDUSTRY .

Progress in Metal-Working and Machinery Markets

ENCOURAGING in the week's developments are closings on several long-awaited orders, two of them in New York. . . . Hendey is to get two thirds of the Brooklyn Navy Yard 17-tool order, with a local dealer getting one or two and the remainder readvertised immediately. . . . The Board of Transportation is splitting its 52-tool Subway list four ways, to Montgomery, Tracy, Pratt & Whitney, and Niles, with Montgomery taking the cream. . . . Cleveland Planer has sold G.E. a 48-in. x 16-ft. openside planer for Pittsfield, possibly indicating reopening of the $1,000,000 inquiry which included this tool. . . . Pensylvania has ordered 60 electric locomotives, split between Westinghouse, Lima, and the Railroad's own shops, with Baldwin building chassis for Westinghouse. . . . . Other orders and inquiries lag, used tools go slowly, and the N.M.T.B.A. forecast places the blame for present difficulties on finance.

NEW YORK dealers also sold a few single items, including a lathe and a shear, although the week in general was very slow. . . . Cleveland has September sales lowest of the year. . . . Midland sold one special tool to Buick. . . . Beside the $2,500,000 Pennsylvania order, Philadelphia has little to report. . . . Detroit, on the contrary, expects a gain next quarter, and tool and die shops there are very busy. . . . Buffalo, with little but hope, suggests a price rise as a scarehead. . . . Cincinnati reports that it is bogged down and expects little to happen soon either way. . . .

CHICAGO had an unsatisfactory September, with isolated improvements and an increase in inquiries as hopeful signs. . . . Used tools there go poorly. . . . Milwaukee also has better inquiries, but orders still come slowly, though September proved better than August. . . . New England is worried about new Soviet credit demands, has automotive inquiries, and expects drilling machine orders from Auburn and Hupp, with good manual training order prospects.

NEW YORK

Two long-awaited orders were closed during the week. Hendey Machine got 12 or 13 of the Navy's 17-tool list for Brooklyn. One other dealer got a tool or two, and the remainder, a couple of large lathes, will be readvertised due to an error in the original specifications. The Board of Transportation list, objected to by a number of dealers because of the millwright work included, is to be divided between Montgomery, Tracy, Pratt & Whitney, and Niles, with Montgomery getting the cream. The first two companies are general machinery dealers. Closing of these two orders follows several weeks of the wildest rumors, including those that both bids would be completely readvertised. Other business of the week was slow; a lathe or two and a shear were sold by one aggressive dealer. No improvement in orders or inquiries developed. Used tools are still a drug on the market.

CLEVELAND

September proved to be a total disappointment. Sales were down to the lowest level of the year. The Pittsfield G.E. plant has ordered a 48 in. x 16 ft. open-side planer from the Cleveland Planer Co., first indication that a delayed million-dollar tool program is again alive. A feature is the purchase by the Midland Steel Products Co., of a special tool for machining rear axles for Buick.

PHILADELPHIA

The most important news is the placing of orders for the chassis and mechanical parts of 60 electric locomotives by the Pennsylvania. Otherwise business in the machinery and machine tool line continued on the same low level of inactivity. Inquiries were few and orders, as has been the case recently, were almost nil.

DETROIT

A slightly more favorable trend is noticeable. The fall programs of the automobile companies are being carried out, and many of the plants are even busier than was expected a few weeks ago. A large number of changes are being made, mostly in body design, but also in the motors and chassis. The tool and die business is exceptionally good and this may or may not indicate an improvement in the machinery trade.

BUFFALO

Reports on business are mixed. The general feeling is optimistic. All dealers report many estimates out, in some cases running into large figures. If half of the business represented by estimates could be placed, all dealers would be happy. Some dealers feel that rise of prices in November would have a good effect on bringing prospective customers to the buying point. In the electrical field there still seems to be less activity than in the machine tool field.

CINCINNATI

The wheels of business seem bogged down in a swampy market. A few small orders are being dragged from the morass by manufacturers, but these are doing very little to relieve the business famine. Local selling agents are keeping up contacts, and in rare instances, are securing a small order from a user who has had a lucky break in getting new business.

CHICAGO

Reports on September business vary but little with reference to its unsatisfactory character. In a few cases a small gain over August occurred, but the majority reported trade on about the same level as that of the preceding month. Somewhat more encouraging, however, is a slight increase in inquiries, although, as one distributor put it, the larger number of these are looked on as "shopping around" for bottom prices. In but one instance was a substantial gain in September business reported. It came from the local manager of a large midwestern plant specializing in railroad shop equipment and represented the closing on inquiries received months ago.

MILWAUKEE

Inquiries have improved, but orders are still coming slowly. Representatives covering Wisconsin report that with the exception of two or three cities, the situation is about the same all over. September proved better than a poor August. The fact that manufacturers are planning new products or diversification is taken to indicate that new equipment will be needed, which, with replacements that must soon be made, is going to produce a good volume of business just as soon as there is more confidence and buying orders are released.

NEW ENGLAND

Of leading concern in New England machine tool centers is the future of Soviet business. New credit demands are being formulated by the Amtorg Trading Corp., aimed to allow 20 to 30 months after delivery for payment, the first installment to be made after one year. Rising difficulties involving importations from Russia also enter into the picture. More inquiries are being circulated from automotive companies, but neither inquiries for resulting orders are in the volume anticipated. Hupp and Auburn have large orders for drilling machines in progress. Lathe and drilling machine requirements for the Government are still held in abeyance. Construction plans point to a fair development of manual training equipment orders. The Farrell Birmingham Co., Ansonia, has closed a large machinery and forgings contract with the D. N. Incinerator Co., Winston-Salem, N. C.

WEEK . BY . WEEK

BUSINESS BAROMETER

Trends in General Business throughout the world

THEODORE H. PRICE
Editor, Commerce and Finance, New York

Comparisons are generally odious and often misleading. Some of them are, nevertheless, helpful when they are intelligently and carefully interpreted. It is now almost two years since it became evident that the greatest Stock Exchange boom in American history had "busted." The decline in security values that followed was amazing and without precedent. Many stocks declined to one-third their previous values, and what usually had been regarded as the light-house of finance proved a poor guide to those who were caught in the seas of speculation when the storm was at its worst.

Last week the converse of the situation that prevailed at the climax of the boom was to be found in every direction. There were many speculative investors who had come to believe that prosperity would be achieved as a result of extravagance, and that abundant credit meant an increase in industrial and commercial activity that would prevent a decline in wages and costs. It was assumed that the demand so created would absorb the over-production that was discernible in some quarters. The new economic era was so thoroughly "sold" to business men as well as to economists that no one paid much attention to the warnings that were to be seen in various directions.

But what some old fellows call "the immutable law of supply and demand" continued to operate, and it was soon plain that a collapse in values would ensue unless production was curtailed. As this became evident, industry began to slow down, business slackened and the indicia of trade commenced to show a decided falling off in the business turnover. There followed what has been generally called a depression.

Great Britain's suspension of gold payments was one of the incidents of this anti-climax, and the world's traders and industrialists are now commencing to ask how long the depression will last, and how long it will be before Great Britain will resume gold payments. These questions are practically unanswerable. During the war Great Britain abandoned gold payments as a military measure, and those who are fond of looking backward insist that she made a mistake in resuming gold payments too soon.

Question Complex

The question involved is an exceedingly complex one, and an adequate and conclusive answer to it is impossible. What the world needs is a stable standard of value that will be accepted at par by all the great nations. If such a standard could be erected and maintained most of our financial troubles would be at an end. Some of the news that came from Europe last week indicates that many of the world's most prominent financiers and economists are in favor of an international token that will be accepted as a standard of value everywhere, and be supported by the credit of all the nations who are able to supply security for their share of the currency issued.

Meantime, silver and the more important commodities are commencing to take a more prominent place in the trading that is chronicled from day to day. Silver has lost a large part of the rise it made when Great Britain's suspension of gold payments was announced, but the market has been active, and interest in it is broadening.

Commercial Market Increase

A substantial increase in activity has also developed in the commercial as distinguished from the financial markets. Some of the commodities dealt in are down; others are up.

The retail trade in the East appears to be on the mend. Some improvement is also reported from the larger cities of the West, but in the smaller towns the local merchants are complaining bitterly of the automobile which enables the women of the community to do much of their shopping in the larger stores of the bigger cities.

The reduction in wages ordered by the United States Steel Corporation and several other large employers of labor has been accepted by the men as unavoidable. There are many who think that the lower wage scale will have a salutary effect. "Whom the Lord loveth he chasteneth" probably expresses the philosophy upon which this observation is based. It may be sound, but there are not many wage earners who will endorse it, and most merchants will agree that business is better when wages are advancing.

For this reason the commercial community is fearful that the so-called depression will be increased by unemployment. This may be true, but there are some who doubt whether the unemployed are as numerous as had been supposed. If experience shall show that a larger number of those who are willing to work can get jobs at fair prices the result may be an autumn and winter of increasing activity, that will bring about a wonderful change in the present doubtful commercial and industrial outlook.

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THE BUSINESS WEEK

October 7, 1931

The last quarter opens without significant sign of autumn acceleration or promising prospect of early improvement in the business picture in any other essential respect . . . It is becoming clearer that the shock to the world's financial nervous system and the disturbance of its international trade metabolism due to the abandonment of the gold standard by a large part of it will require emergency treatment and a prolonged period of convalescence . . . So far the American securities markets have withstood the shock with surprising strength, assisted by a drastic ligature of limitations on short-selling, but how far they will be able to stand the steady pressure of world-wide credit liquidation and the accompanying gold hemorrhage remains to be seen . . . Fortunately, the Federal Reserve is freely offering its transfusions of reserve credit to maintain easy money conditions in this market in face of emergency foreign and domestic demands . . . Meanwhile current indicators give no evidence that business is going to break through the rock bottom resistance level which bare replacement demands have established since last December, in spite of the pressure of accumulating credit difficulties and disappointing performance in security and commodity markets . . . Our index still holds above the 70% line, despite persistent weakness in most components, and there is some reassurance in the super-seasonal strength of building projects.

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Material Trends and Prices . . . .

Prices of non-ferrous metals show lessened tendencies to change, compared with levels of the last ten days. Tin and zinc are the weakest of the commonly used metals, so far as demand and prices are concerned. Decreases of approximately 2c. per lb. on the principal rolled or drawn brass and copper products, reflect no change in demand but are due instead to a revision of the base from 100 lb. to 1,000 lb., minimum order. Lowered steel-mill wages have resulted in no change in prices of finished material. Operating rate is still at the year's low mark, despite the fact that a seasonal increase normally is due at this time.

(All prices as of Oct. 2, 1931)

IRON AND STEEL

Pig Iron—	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$12.00	$12.00	$14.00
Buffalo, No. 2, Fdry., per gross ton	17.00	17.00	15.50
Heavy Melting Steel Scrap— Pittsburgh consuming point, No. 1, per gross ton	10.50	10.50	14.50
Furnace Coke—Connellsville, per net ton	2.40	2.40	2.60
Foundry Coke—Connellsville, per net ton	3.25	3.25	3.50
Steel Shapes—Pittsburgh, base, per 100 lb	1.60	1.60	1.60

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Iron Machinery Castings—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb:

Chicago	4.62½	Cleveland	4.50	New York	4.75
Cincinnati	4.40	Detroit	4.00		

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Steel Sheets—Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Blue annealed, No. 10*	1.85	3.20	3.00	3.40
Black sheets, No. 24	2.40	3.55	3.60	3.50
Galvanized, No. 24	2.90	4.10	4.00	4.00

* Light plates.

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Seamless Steel Tubing—Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall		Outside Dia. in Inches						
		½	¾	¾	⅞	1	1¼	1½
Inches	B.w.g.	Price per Foot						
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

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Shapes, Plates, Bars, Etc.—Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.90	3.60	3.60
Cold fin., round or hexagon	3.40	3.10	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.65	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

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Stainless Steel—Hot-rolled bars, base, Pittsburgh. 0.12 per cent carbon, cents per lb:

Chromium		Chromium	
15% and under	19.00	18 to 23%	23.00
15 to 18%	20.50	23 to 30%	28.00

Bolts and Nuts—Discount from list, f.o.b. mills, Birmingham Chicago, Cleveland and Pittsburgh, on machine bolts, all sizes, cut thread; nuts, hot-pressed or cold punched; and lag screws, mill lots 75-10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:	
Aluminum ingots, 99%, N. Y.	23.30
Copper, electrolytic, Conn	7.00
Copper wire, base, Chicago and Cleveland	9.37½
Copper wire, base, N. Y.	9.25
Lead, pigs, E. St. Louis	4.22½
Tin, Straits, pigs, spot, N. Y.	22.50
Zinc, slabs, E. St. Louis	3.65
Prices following are in cents per lb., base, N. Y., Chi. and Cleve:	
Brass rods, high	11.25
Brass sheets, high	13.00
Brass tubing, high	16.25
Copper, drawn round	13.62½
Copper sheets	16.12½
Copper tubing	15.62½
Prices following are in cents per lb., del. from N. Y. warehouse:	
Babbitt, anti-friction, general service	29.00
Babbitt, com'l, intermediate grade	34.75
Babbitt, genuine, highest grade	43.00
Solder, bar	18.12½
Prices following are in cents per lb., base, Huntington, W. Va:	
Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals—Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	2.75	2.75	2.75
Light brass	2.25	1.75	2.25
No. 1 rod-brass turnings	3.00	3.00	2.75
Heavy copper	5.25	4.50	4.12½
Light copper	4.25	4.00	4.00

SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminous oxide, No. 50 grain, cloth, 6-in. dia., X weight, per 100	$4.37	$4.59	$4.59
Belting, leather, heavy, discount	30-10%	40%	40%
Belting, rubber, trans., 1st grade, discount	60-10-10%	60-10%	60%

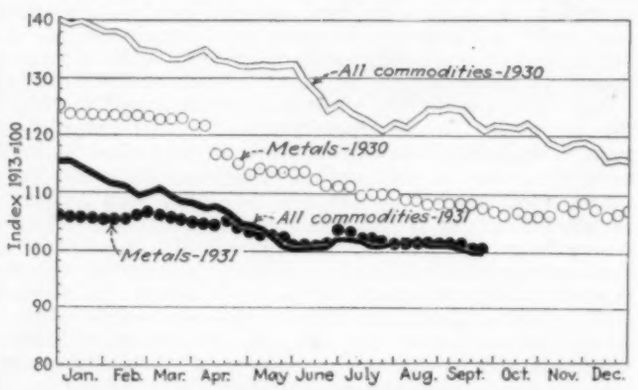
Lumber—Per M ft., b.m., 12-16 ft. lengths, del., N. Y:

Crating—Southern pine:

1x4-in. ..... $20.00 1x6-in. $22.00

Skids—Spruce:

2x4-in. .$32.00 3x4-in. .$33.00 4x6-in. .$35.00 6x6-in. .$38.00



Price Indexes Week by Week

(6 Metals and 74 Commodities—Figures from The Annalist.)

NEWS

Tool Builders Complete Standard Cost Manual

Three years ago the National Machine Tool Builders' Association secured the services of ALBERT E. GROVER, of Berea, Ohio, as staff cost consultant to work with member companies, to standardize cost finding methods in use in their shops and to produce a cost manual. Mr. Grover studied a wide variety of methods in use and embodied the best in a series of bulletins which were issued to industry for criticism and comment and also discussed at some 23 conferences. All suggestions and criticisms thus developed were embodied in the text of the manual, which was then edited by three cost executives of the industry. The resulting manual, complete, concise and up-to-date, is to be issued in ring binder form, each chapter being a separate unit, permitting rewriting or improving of any chapter without disturbing the remainder of the volume. The manual, because of its general nature, is not only suitable for machine tool builders, but for general machine shop use.

Mr. Grover, his work being complete, is reentering private practice, with an office at Berea. He will continue to serve the Association in a consulting capacity.

Boat and Engine Show

A motorboat and marine engine show, occupying all four exhibit floors of the Grand Central Palace, will be held Jan. 22-30, according to HENRY R. SUTPHEN, president of the National Association of Engine & Boat Manufacturers.

Iron & Steel Meeting Scheduled This Month

The fortieth general meeting of the American Iron & Steel Institute will be held at the Hotel Commodore, New York City, on Oct. 23. There will be the usual sessions, morning and afternoon, at which technical papers will be read, followed by a banquet in the evening. The technical papers include "Experiments in Speech and Music," by L. S. O'ROARK, Bell Telephone Laboratories; "The Bessemer Process and its Product," by PROF. R. S. MCCAFFERY, of the University of Wisconsin; "The Metallic Charge in Basic Open Hearth Operations," by C. D. KING, chairman of the Open Hearth Committee, U. S. Steel Corp.; "Magnetic Iron and Steel," by DR. T. D. YENSEN, research engineer of Westinghouse Electric & Mfg. Co.; and "Factors That Affect the Welding Qualities of Steel," by WILMER E. STINE, research engineer of the Lincoln Electric Co.

Boiler Operated At 3,200 Lb. Pressure

Purdue University was host to five members of the principal research committee of the A.S.M.E., Oct. 2-3. DEAN A. A. POTTER, of the School of Engineering at Purdue, is a member of this committee, under whose direction all other research committees of the society operate. Boiler tests are now being performed at the university with a boiler operated at and above 3,200 lb. per sq.in. pressure.

A.S.T.M. Committee Adds New Standards

A.S.T.M. Committee E-10 on Standards, at a recent meeting, approved thirteen new tentative specifications and methods of test and revised four existing tentative standards. New tentative standards include Specifications for Electric-Fusion-Welded, Electric-Resistance-Welded, Forge-Welded and Lock-Bar Steel Pipe, and Riveted Steel and Wrought-Iron Pipe, Method of Bend Testing for Ductility of Metals, and Specifications for Round-Hole Screens for Testing Purposes. Revisions of existing tentative standards include Specification for Copper-Base Alloys in Ingot Form for Sand Castings.

Automobile Production Declined in August

Automobile production in August was 187,197 vehicles, the lowest since last January's 171,848, according to a report of the Department of Commerce. This output compares with 218,490 vehicles in the preceding month, and 224,368 in the same month last year. Reductions were noted in all lines. Passenger car production declined from 183,993 in July to 155,321. The truck output was 31,772 for August, against 34,317 for the previous month, and the production of taxicabs fell from 180 vehicles to 104 in the same period.

U. S. Gainful Workers 48,832,589

The Director of the Census has announced returns for gainful workers, taken from the last census to show 98,723,047 persons 10 years of age and over, 48,832,589 of these being returned as gainful workers. This represents 49.5 per cent of the population over 10 years of age, or 39.8 per cent of the total population (122,775,046). Of the whole number of gainful workers, 38,053,795 were males, forming 76.2 per cent of the male popuation 10 years old and over, or 61.2 per cent of the total male population. The 10,778,794 female gainful workers formed 22.1 per cent of the female population 10 years old and over, or 17.8 per cent of the total female population. The percentage of the male population 10 years of age and over gainfully employed in 1930 was materially lower than the percentage in 1920, which in turn was lower than the percentage in 1910 or 1900. The percentage of the female population on the contrary, was considerably higher than the percentage in 1920 and decidedly higher than the percentage in 1900.

General view of the auditorium at the American Electric Railway Convention last week in Atlantic City

Freight Loading Increases

Loading of revenue freight for the week ended Sept. 19 totaled 742,628 cars, an increase of 74,878 cars above the preceding week, but a decrease of 209,933 cars below the corresponding week last year.

Net operating incomes of all Class I railroads in August were about $56,500,000, against $95,603,000 in August, 1930, a drop of 40 per cent, and against $141,758,000 in August, 1929, a decrease of 60 per cent. Their net operating incomes in July were $56,903,000.

Merchandising Clinic Planned by Foundrymen

Gray iron foundrymen are planning a "merchandising clinic" to be held during the fourth annual convention of the Gray Iron Institute, Inc., West Baden Springs, Ind., Oct. 15-16. GEORGE L. WILLMAN, merchandising expert of Chicago, will be in charge of the "clinic," according to ARTHUR J. TUSCANY, manager of the Institute. Problems of the industry, and the development of new markets will be considered. W. J. BARRETT, who is serving on President Hoover's employment commission, is to speak on the employment situation. The convention will close with a golf tournament Friday afternoon and the annual banquet Friday night.

According to the August trade report of the Institute, the ratio of production during the month to normal production shows a slight decline under July. The same situation applies to new business. Production by districts indicates the greatest activity was experienced in District No. 3, or the territory comprising the states of Wisconsin, Illinois, and area West of the Mississippi River and South to the border. By normal volume, Class "A" plants (production of 1-100 tons per month) were most active.

300,000 Man-Hours Safety Record

The sheet metal plant at the Oshawa Body Plant, General Motors Corp., Ltd., of Canada, has gone 300,000 man-hours without a lost-time accident, according to C. R. COMPLIN, safety engineer.

Steel Founders Set Meeting Dates

At a meeting of the board of directors of the Steel Founders' Society of America, Inc., held in Chicago recently, the following meetings were scheduled: Oct. 22—Hotel Roosevelt, New York, N. Y.; Dec. 10—Hotel William Penn, Pittsburgh, Pa., and Jan. 21, 1932—(Annual Meeting) Chicago, Ill.

At a meeting of the Cost Committee, a standard form of estimating sheet was tentatively adopted, based on the Society's uniform cost system. This will later be published as a supplement to the Uniform Accounting and Cost Manual for Steel Foundries.

The Society has also developed and published a booklet entitled "Some Statistics on the Steel and Alloy Foundry Industry," containing tables and comparisons on the production and equipment of steel foundries in the United States and Canada. Copies of the booklet may be obtained from the Society at 420 Lexington Ave., New York City.

O. F. STROMAN

Westinghouse Reorganizes Industrial Sales

The industrial sales department of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been reorganized under the direction of O. F. STROMAN, industrial sales manager. The reorganized department is composed of units grouped according to the main classifications of industry. Two assistant sales managers and 14 divisional managers have been appointed and the new organization also provides for the grouping of specialized engineers with every sales division. BERNARD LESTER and C. B. STAINBACK have been appointed assistant sales managers. Mr. Lester will have general charge of directing from headquarters the development of business with industrial users of electrical equipment, while Mr. Stainback will have charge of apparatus applying to these industrial groupings. Under Mr. Lester there has been created five industry divisional classifications with the following in charge: G. E. STOLTZ, manager, mining and metal working electrification division; G. D. BOWNE, manager, general mill electrification division; J. W. SPEER, manager, machinery electrification division; E. B. BREMER, manager of the appliance electrification division, and E. E. MEAD, manager, general industrial resale division.

Nine divisions have been created under Mr. Stainback's supervision. They are headed by J. R. OLNHAUSEN, manager, medium A.C. motor section; R. M. DAVIS, manager, medium D.C. motor section; R. O. WATSON, manager, large motor section; D. H. BYERLY, manager, small motor section; W. W. REDDIE, manager, welding section; T. C. KELLEY, manager, industrial heating apparatus; W. G. BALPH, manager, safety switch section; W. H. MCGILLIVRAY, manager, control section; and F. W. HORST, manager cost section.

J. M. MCKIBBIN, JR., has been appointed manager of the promotion and advertising section and will function under the joint direction of the assistant sales managers.

Bernard Lester, and (Right) C. B. Stainback

Progress of M.E.A. Reorganization Plan

Reorganization plans of the Motor & Equipment Association have progressed to the point where the two resulting organizations, the Motor & Equipment Manufacturers' Association and the Motor & Equipment Wholesaler's Association, have chosen officers and directors to function until Jan. 1, 1932, when duly elected officers and directors will take office. Officers for 1932 will be elected at the convention to be held in Atlantic City, Dec. 7-12.

The Motor & Equipment Manufacturers' Association has chosen as temporary officers: President, GEORGE L. BRUNNER, of the Brunner Mfg. Co.; vice-president, DAVID BEECROFT, of the Bendix Aviation Corp.; treasurer, C. H. BURR, SKF Industries, and secretary, C. C. SECRIST, of the Victor Mfg. & Gasket Co. A. H. EICHHOLZ, who has been functioning as assistant to the president of the M.E.A., will become general manager of the Motor & Equipment Manufacturers' Association.

BUSINESS ITEMS

The Timken-Michigan Co., Detroit, Mich., has been formed to manufacture and sell a complete line of lubricated and non-lubricated plug valves and leak clamps for use on cast-iron bell and spigot pipe. R. J. GOLDIE, vice-president and general manager of the Michigan Valve & Foundry Co., is president, and FRED GLOVER, president of the Timken-Detroit Axle Co., is vice-president of the new organization. W. C. WOOD, secretary-treasurer of The Timken-Detroit Axle Co., will serve in a similar capacity with the new company. The board of directors includes D. S. DEVOR, vice-president in charge of manufacturing of The Timken-Detroit Axle Co., and W. F. ROCKWELL, president of the Pittsburgh Equitable Meter Co.

The Pittsburgh Steel Products Co., a division of the Pittsburgh Steel Co., has purchased from the Aetna Standard Engineering Co., Youngstown, Ohio, a complete new unit of the push bench type for the manufacture of seamless steel tubes. This process, not previously used in this country, is capable of producing tubes of very small diameter by the hot-rolled reducing process.

The Stoughton Co., Stoughton, Wis., established 76 years ago as the Stoughton Wagon Co., is inaugurating a campaign to include entry into the field of manufacturing trailers and a general line of motor truck equipment. CHARLES R. JAHN, for several years sales manager of the Highway Trailer Co., Edgerton, Wis., has joined the Stoughton Co., as general manager of the new division, which has been engaged in experimentation since its organization a year ago. F. J. VEA is president.

The Bump Mfg. Co., 1803 West Ave., south, LaCrosse, Wis., manufacturer of pumps, fasteners, and other metal parts, has been reorganized. R. E. MCKENZIE has assumed the controlling interest and becomes general manager. He formerly headed the McKenzie Mfg. Co., manufacturer of agricultural machinery. GEORGE P. BUMP, founder of the Bump Mfg. Co., and still a large stockholder, will remain with the company in an engineering capacity.

The Apex Electric Mfg. Co. is transferring its electric refrigeration manufacturing plant from Fort Wayne, Ind., to Painesville, Ohio. Two hundred men will be moved, according to C. G. FRANZ, president. The company has leased a building on Richmond St., formerly occupied by the Bakelite Corp. and later by the Metallic Binding Co., and including 30,000 sq.ft.

The plant and equipment of the Automatic Products Co., Ltd., Stratford, Ont., have been leased to THOMAS L. MAY with option to purchase. Mr. May has been employed for some years in the tool department of the Ford Motor Co. of Canada, Ltd., Walkerville, Ont. The business will be operated under the name of the Stratford Machine & Tool Co., with Mr. May as sole proprietor.

The Dayton-Rogers Mfg. Co., 1114 South Third St., Minneapolis, Minn., has appointed the following district sales representatives: Arthur C. Krause, 5526 North 34th St., Wilwaukee, Wis.; Charles Ricker, Jr., 154 Nassau St., New York, N. Y.; H. B. Kendal, 5-136 General Motors Bldg., Detroit, Mich.; H. A. Keith, 3104 Mapledale Ave., Cleveland, Ohio, and Edward C. Leininger, 910 Chestnut St., Adrian, Mich.

The new mechanical engineering building erected at the University of Wisconsin, Madison, Wis., during the past year at an approximate cost of $577,000, is being used for the first time this semester for classes and shop work by students enrolled in mechanical engineering courses. PROF. J. M. DORRANS is professor of mechanical practice and superintendent of machine shops.

The Pennsylvania Railroad has ordered sixty electric freight locomotives for its electrification project. $2,500,000 worth of orders for chassis and mechanical parts construction have been awarded. Lima (Ohio) Locomotive Works will build thirty, Westinghouse will build twenty at Eddystone, Pa., and the Pennsylvania Railroad will build ten at Altoona, Pa. Baldwin will build the $800,000 worth of chassis and mechanical parts for Westinghouse's share.

Announcement is made that the Simplex Valve & Meter Co., Philadelphia, Pa., have organized the Simplex Valve & Meter Co. of Canada, Ltd., with offices at 32 Front St. West, Toronto, for the purpose of manufacturing and selling the Simplex lines in Canada. The business will be under the management of D. B. MCWILLIAMS, formerly manager of the Victaulic Co. of Canada, Ltd., Toronto.

The Mechanical Engineering Co., 3778 N. Fratney St., Milwaukee, Wis., has been incorporated and is engaging in the manufacture of tools, dies, jigs and fixtures. WILLIAM DRAHONOVSKY is president; WILLIAM KOPP, vice-president, and F. J. HEATON, secretary and treasurer.

The Birmingham office of the Independent Pneumatic Tool Co. has been moved from the Comer Building to 915 North Seventh Ave. H. F. HALBERT is manager.

The Cleveland (Ohio) Planer Co. has received an order for a 48 in. x 16 ft. planer for the Pittsfield G. E. plant.

Hardinge Bros., Chicago, are moving their entire organization to Elmira, N. Y., shortly. Only a sales office will be maintained in Chicago.

The George R. Borrmann Steel Co., Eighth & Fallon Sts., Oakland, Calif., is occupying a new building there.

HARRY M. PERRY, tool and parts retailer, of Los Angeles, Calif., has taken over the entire two-story building at 737 North Spring St.

Redman Wins Grasselli Medal

The Grasselli Medal, industry's annual tribute to distinction in applied chemistry, has been awarded for 1931 to DR. L. V. REDMAN, vice-president and director of research of the Bakelite Corp., it has been announced by the

American Section of the Society of Chemical Industry, a British organization. The selection of Dr. Redman, who is president-elect of the American Chemical Society, was based upon industrial studies, the results of which were embodied in a paper on "Cost of Research and its Apportionment" read before a joint meeting of the American Section of the Society of Chemical Industry with the New York section of the American Chemical Society, the Societe de Chimie Industrielle and the American Electrochemical Society on Dec. 9, 1927.

The medal will be bestowed upon Dr. Redman at an assembly of the chemical societies of the New York area on Nov. 6. PROF. D. D. JACKSON, executive officer of the Department of Chemical Engineering, Columbia University, will make the speech of presentation. F. W. WILLARD, Works Manager of the Western Electric Co., Kearny, N. J., will describe the accomplishments of the medalist. Dr. Redman will deliver an address on "Research as a Fixed Charge." Dr. Redman became vice-president and research director of the Bakelite Corp. in 1922.

PERSONALS

LAMONTE J. BELNAP has been appointed chairman of the executive committee of the Worthington Pump & Machinery Corp., Harrison, N. J. He will be succeeded as president by HARRY C. BEAVER, formerly vice-president. As chairman of the executive committee, Mr. Belnap will maintain his active part in directing the manufacturing, sales and financial activities.

EDWARD A. PRIDMORE, president, International Molding Machine Co., Chicago, accompanied by his son, HAROLD E. PRIDMORE, affiliated with the same organization, sailed for England recently.

HENRY WILLIAM ALLINGHAM, formerly joint managing director of the Hoyal Body Corp., Waybridge, England, is now engaged in independent consulting engineering work in London.

CHARLES H. BAUER, for the past six years manager of the Automotive Division, L. H. Gilmer Co., Philadelphia, has been appointed general sales manager.

STUART G. BAITS, chief engineer of the Hudson Motor Car Co., has returned to active duty after an absence of a number of weeks following an automobile accident.

FRANK E. BARTLEY, of Cambridge, Mass., who for quite a number of years was connected with the Blanchard Machine Co., has been added to the selling force of The Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.

C. W. BENNETT, of Pittsburgh, has been named vice-president in charge of operations of the American Sheet & Tin Plate Co., a subsidiary of the United States Steel Corp. He has been with the company almost twenty-five years and succeeds WILLIAM IRWIN, who recently became vice-president of the United States Steel Corp.

L. A. BLACKBURN, formerly works manager for the Oakland Motor Car Co., Pontiac, Mich., has been made president of the Evans Appliance Co., Detroit, manufacturer of pumps.

L. P. BURGESS, former vice-president and general manager of the D and B Pump & Supply Co., Los Angeles, manufacturer of oil well equipment, has been elected president of Metlox Corp., Ltd., Los Angeles and Manhattan Beach, Calif., manufacturer of Neon signs. Mr. Burgess succeeds the late THEODORE C. PROUTY. The corporation also announced that WILLIS O. PROUTY has been elected vice-president in charge of manufacturing and sales.

MILTON T. CLARK, formerly president of the Campbell Industrial Window Co., a division of the American Radiator & Standard Sanitary Corp., has been elected president and a director of the Vitaglass Corp.

A. LUDLOW CLAYDEN, research engineer of the Sun Oil Co., has moved his headquarters from Philadelphia to Detroit in the first National Bank Bldg.

HOWARD H. COOK has been elected secretary of the American Iron & Steel Institute, 75 West St., New York City. He has for some time been assistant secretary.

HARLEY J. EARL, chief designer of the Fisher Body Corp., left for Europe recently on the *Bremen* to visit General Motors plants in Germany and Norway. He will return about Nov. 1.

LAMAR S. PEREGOY, president of the Sivyer Steel Casting Co., Milwaukee, recently was appointed to the board of directors of the Steel Founders' Society of America, Inc.

GEORGE F. FULLER, former president of the Wyman-Gordon Co., Worcester, Mass., has been named chairman of the board, and HARRY G. STODDARD, former vice-president, succeeds him as president. F. A. INGALLS has been re-elected vice-president; C. C. WINN, formerly assistant treasurer, has been elected treasurer at Worcester, and F. P. MILLER, formerly cashier at Harvey, Ill., has been elected assistant treasurer at that works. S. M. HAVENS, formerly works manager at Harvey, is now general manager there; R. M. POWELL, formerly sales agent at Detroit, is general sales manager there; J. B. SUTHERLAND, formerly general sales agent, is now assistant to the president; H. F. WOOD, formerly assistant works manager, has become works manager of the Ingalls-Shepard division; J. H. NELSON has been reappointed works manager, Worcester division, and F. E. WELLINGTON has been appointed Worcester division district sales manager.

WALTER H. GARDNER, advertising manager for the Caterpillar Tractor Co., Peoria, Ill., has been made manager of specialty sales division, and GERALD M. WALKER, his assistant, has been made advertising manager.

HARRY J. HATER, vice-president and general manager of Aluminum Industries, Inc., has been appointed a member of the Manufacturers' Divisional Committee of the National Standard Parts Association, to succeed F. J. GLENNON, general sales manager of Aluminum Industries, Inc., who died recently.

FREDERICK W. HAZEN, formerly vice-president in charge of production of the Whittlesey Mfg. Co., Bridgeport, Conn., has become general superintendent of the Providence Dry Dock & Marine Railway Co., East Providence, R. I.

COL. N. L. HOWARD has been elected president of the North American Car Co., Chicago, to succeed ERWIN R. BRIGHAM, who has resigned. Colonel Howard will continue as chairman of the board. Mr. Brigham remains as a director and member of the executive committee.

A. L. HUMPHREY, president, and C. A. ROWAN, executive vice-president of the Westinghouse Air Brake Co., Wilmerding, Pa., with G. A. BLACKMORE, president of the Union Switch & Signal Co., Swissvale, Pa., sailed recently for a business tour of England and the continent.

J. HARPER JACKSON, of the Pittsburgh Gear & Machine Co., Pittsburgh, Pa., will discuss "The Fallacy of Costing on an Average Basis" at the forthcoming semi-annual meeting of the American Gear Manufacturers Association, in Pittsburgh, Oct. 15-17. A discussion of "Mark-Up on Raw Material" will also be given by two or more member companies including the Covert Gear & Mfg. Corp. and the D. O. James Mfg. Co.

W. S. KNUDSON, president and general manager of the Chevrolet Motor Co., has sailed for Southampton, England, to make a first-hand study of European business conditions. He will return in about four weeks.

CHARLES F. KETTERING, president of the General Motors Research Corp., and vice-president of General Motors Corp., sailed recently for Europe aboard the *Bremen* on a business trip.

SNOWDEN E. LEA, formerly foreman of the Keystone Aircraft Corp., Bristol, Pa., is now in charge of Autogiro service of Pitcairn Aircraft, Inc., Willow Grove, Pa.

M. W. MCCONKEY, vice-president of the Bendix Brake Co., South Bend, Ind., has become a vice-president of the Bendix Research Corp., formed recently by the Bendix Aviation Corp., and the Standard Oil Co. of Indiana to manufacture and market grease fittings for automotive and industrial machinery, grease-dispensing equipment and automotive lubricants and to provide lubrication service. W. J. BITNER, treasurer of the Bendix Aviation Corp., Chicago, is also treasurer of the new company. L. C. WELCH, on the directorate of the new company, is manager of the lubrication department of the Standard Oil Co. of Indiana. A. Y. DODGE, general manager of the Lubrication Corp., is executive engineer in South Bend of the Bendix Research Corp.

STEVEN J. MENZEL, formerly sales manager of the stamping division, Briggs Mfg. Co., Detroit, Mich., has become stamping engineer with the Graham-Paige Motors Corp., Detroit.

J. W. MILL, formerly engineer in charge of the experimental work at Humber, Ltd., Coventry, England, has become general manager for Coventry Climax Engines, Ltd., also of Coventry.

CHARLES W. NASH, president of the Nash Motors Co., Kenosha, Wis., has been appointed one of the seven citizens to serve on the new executive council created by the recent session of the Wisconsin state legislature to aid Gov. PHILIP F. LAFOLLETTE and to consider possible legislation.

D. B. PATTERSON has been made vice-president of the Harnischfeger Corp., Milwaukee, Wis.; H. S. STROUSE, former advertising manager, becomes treasurer, and office formerly held by WALTER HARNISCHFEGER, president; and J. O. FERCH, former assistant, becomes advertising manager.

ALFRED J. POOLE has resigned as manager of the manufacturers sales department, Robert Bosch Magneto Co., to join the Bendix Aviation Corp., N. Y. C.

W. C. ROBBINS, former chief engineer of the Houde Engineering Corp., Buffalo, and for the past two years vice-president in charge of engineering and manufacturing of the Gabriel Shock Absorber Co., Cleveland, has become vice-president and general manager of the Thermo Hydraulic Shock Absorber Co., Cambridge, Mass.

MORRIS SLEPKOW, for thirty-four years in the employ of the Diamond Machine Co., Providence, R. I., first in the manufacture and later in the selling of face grinders, has been added to the selling force of The Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.

D. MYLES SHEPARD, sales manager of Landers, Frary & Clark, New Britain, Conn., has been elected vice-president.

HARRY SLOAN, advisory engineer of the Vilter Mfg. Co., Milwaukee, has been nominated without opposition for president of the Engineers Society of Milwaukee. Other nominees, also unopposed, include: Vice-president, FRASER JEFFREY, electrical engineer, of Allis-Chalmers Mfg. Co.; secretary, HUGO W. ROHDE, treasurer, WALTER R. MUELLER. Nominees for directors, three to be elected, are: RAY E. NEWHOUSE, chief engineer, crushing and cement department, Allis-Chalmers Mfg. Co.; FORREST NAGLER, mechanical engineer, A. O. Smith Corp.; ERNEST F. VILTER, Haven Mfg. Co.; GEORGE G. POST, chief electrical engineer and vice-president, Milwaukee Electric Railway & Light Co.; FRED A. HANSON, manager, Hevi-Duty Electric Co., and JAMES BROWER, superintendent, Milwaukee Sewerage Commission. The election will be held Oct. 21.

LON R. SMITH has been elected secretary-treasurer of the Melaum Mfg. Co., Indianapolis. He was formerly assistant director of sales of the Hercules Motors Corp., Canton, Ohio.

FRANK S. SPRING has been appointed engineering stylist for Hudson-Essex automobiles.

SIR WILLIAM STAVERT has been elected chairman of the board of directors of the Algoma Consolidated Corp., and W. C. FRANZ has been appointed president of the corporation and its subsidiary, Lake Superior Corp. ALEX TAYLOR, previously mentioned in connection with the presidency of these two companies, is still in England, and has been prevented from resuming his connection with the companies owing to ill health.

ROBERT L. STREETER, since 1920 vice-president of the United States Aluminum Co., Pittsburgh, and general superintendent of fabricating plants, has resigned. Shortly after the war he became affiliated with the Aluminum Co. of America as chief mechanical engineer and was appointed to the office from which he resigned in November, 1920. He was actively identified with the design, construction and equipment of the new structural mill at Massena, N. Y., and other important additions to the fabricating plants.

DR. STERLIN TEMPLE, DR. B. S. LACY, DR. A. M. MUCKENFUSS, DR. J. F. REICHERT, DR. C. J. WERNLUND, A. T. HAWKINSON, A. W. RUDEL, J. M. WAINSCOTT and H. A. BOND, members of the research staff of the Roessler & Hasslacher Chemical Co., Inc., have been transferred from the plant at Perth Amboy, N. J., to the Niagara Falls (N. Y.) plant.

R. C. TODD, formerly assistant general sales manager, has been appointed assistant vice-president of the American Rolling Mill Co., Middletown, Ohio. He will be succeeded by H. M. RICHARDS as assistant general manager of sales.

Col. E. A. Simmons, Publisher and Executive, Dies

Blank & Stoller

COL. EDWARD ALFRED SIMMONS, 56, president of the Simmons-Boardman Publishing Co., New York City, publishers of "The Railway Age" and six other transportation trade papers, died suddenly Sept. 30, in Brooklyn, N. Y. He entered the employ of the Simmons-Boardman concern at the age of 14 in 1889, became its secretary in 1898, was elected a director, vice-president and treasurer in 1903, and had been its president since 1911. He was also president and chairman of the board of the American Builder Publishing Corp., the American Machine Tool Co. and the American Saw Mill Machinery Co., and president and a director of the American Saw Works.

Colonel Simmons served as a major in the construction division of the United States Army for the two years this country was in the World War. After peace was declared he became a Colonel in the Quartermaster Reserve Corps. He was chairman of the endowment committee of the Engineering Foundation, Inc., and of the American Marine Standards Committee and held a similar position in the United States delegation to the International Railway Congress in Madrid last year. He was recognized as an authority on water and rail transportation.

DEAN C. BABCOCK, 35, manager of divisional branch factories of the Four Wheel Drive Auto Co., Clintonville, Wis., died from appendicitis Sept. 21.

FRANK C. BATCHELDER, 74, formerly president of the Baltimore & Ohio's Chicago Terminal Co., and formerly vice-president of the Baltimore & Ohio Railroad Co., Chicago, died there Sept. 28 of heart disease.

JOHN G. DUNN, 57, vice-president of the Standard Mfg. Co., manufacturer of oil well supplies and equipment, Butler, Pa., died of a heart attack Sept. 25.

ADAM KREUTER, 70, vice-president, director and general factory manager of the American Laundry Machinery Co., Chicago, died Sept. 26, at McHenry, Ill.

THOMAS L. LAMALTA, 54, president of the Chickasaw Machine & Foundry Co., Memphis, Tenn., for many years, died recently.

JOHN G. MESKER, 62, works manager of the Bruce MacBeth Engine Co. for the past twenty years, died Sept. 22 at Cleveland. Mr. Mesker was superintendent of the machine shop of the old Cleveland Shipbuilding Co., later taken over by the American Shipbuilding Co., and is a brother of L. W. MESKER, works manager of Cleveland Planer Co.

F. I. SHEEHAN, 33, formerly chief engineer of the M. H. Detrick Co., Chicago, and more recently Pacific coast district manager, was killed Sept. 16 in an airplane accident.

THOMAS W. SUDDARD, 49, secretary and plant manager of the Hamilton Mfg. Co., Two Rivers, Wis., died recently following an operation.

FRED C. TASHENBERG, 58, president of the Tashenberg Boiler Works, Buffalo, was drowned in Buffalo harbor recently.

R. HENRY TODD, 64, general superintendent of the shops of the Rutland Railroad at Malone, N. Y., died recently there, following an illness of two years.

CHARLES C. UPHAM, 77, president of the Diebold Safe Lock Co., Canton, Ohio, died at his home there recently of apoplexy.

MEETINGS

SOCIETY OF AUTOMOTIVE ENGINEERS
National production meeting. Detroit, Mich., Oct. 7-8. John A. C. Warner, secretary, 29 W. 39th St., New York.

NATIONAL SAFETY COUNCIL
Twentieth Annual Safety Congress, Chicago, Ill., Oct. 12-16. W. H. Cameron. Secretary, 20 North Wacker Drive, Chicago.

SOCIETY OF INDUSTRIAL ENGINEERS
Annual meeting, Pittsburgh, Pa., Oct. 14-16. George C. Dent, secretary, 205 W. Wacker Drive, Chicago, Ill.

GRAY IRON INSTITUTE
Fourth annual convention. West Baden Springs Hotel, West Baden Springs, Ind. Oct. 15-16. J. Arthur Tuscany, secretary, Terminal Tower Bldg., Cleveland.

AMERICAN GEAR MANUFACTURERS ASSOCIATION
Semi-Annual Meeting, William Penn Hotel, Pittsburgh, Pa., Oct. 15-17. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

STEEL FOUNDERS' SOCIETY OF AMERICA, INC.
New York meeting. Oct. 22. Granville P. Rogers, managing director, 932 Graybar Bldg., New York, N. Y.

SOCIETY OF AUTOMOTIVE ENGINEERS
National transportation meeting, Washington, D. C., Oct. 27-29. John A. C. Warner, secretary, 29 W. 39th St., New York, N. Y.

AMERICAN MANAGEMENT ASSOCIATION
Industrial marketing conference, Hotel Statler, Cleveland, Ohio, Nov. 11-13 Headquarters, 20 Vesey St., New York, N. Y.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Annual meeting, Engineering Societies Bldg., New York, N. Y., Nov. 30-Dec. 5. Calvin W. Rice, secretary, 29 West 39th St., New York, N. Y.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Calif., Bay Point—Armstrong Cork Co., Lancaster, Pa., has completed plans for the construction of a manufacturing plant at Bay Point near Martinez. To cost $1,000,000. Maturity indefinite.

Calif., Southgate—Firestone Tire & Rubber Co., Manchester Ave. and Alameda St., Los Angeles, plans the construction of a battery factory here. Estimated cost to exceed $150,000.

Colo. Pueblo—Mountain Electroplating & Rustproofing Co., c/o William H. Raschke, 2300 Elizabeth St., plans to remodel electroplating plant at 102 Greenwood St., also purchase new equipment.

Conn., Meriden—Connecticut Light & Power Co., A. Jordan, Mgr., awarded contract for the construction of a 1 story garage and service building on Cooper St. Estimated cost $40,000.

D. C., Washington—U. S. Engineers Office, plans a storage and shop building at 11th and O Sts. S. E. Will build by separate contracts.

Ill., Chicago—Firestone Tire & Rubber Co., 1278 South Main St., Akron, O., awarded contract for the construction of a 3 story sales, service and storage building here. Estimated cost $350,000. Noted Sept. 3.

Ia., Dyersville—Iowa State Highway Commission, J. A. Paulsen, Dist. Engrs., 503 Marsh-Place Bldg., Waterloo, awarded contract for the construction of a maintenance garage here. Noted Sept. 24.

Ia., Marion—Iowa State Highway Dept., T. H. Jones, secy., Ames, will build a 1 story, 34 x 124 ft. maintenance garage at 10th Ave. and 23rd St. Estimated cost $18,000.

Ia., Sibley—Iowa State Highway Commission, E. W. Dunn, Dist. Engr., Court House, Sioux City, awarded contract for erection of a garage building here. Noted Sept. 24.

Me., Dixfield—Berst-Foster-Dixfield Co., F. W. Smith, Mgr., West Peru, awarded contract for a 3 story, 105 x 200 ft. addition to factory here. Estimated cost $40,000. Noted Sept. 17.

Mass., Boston—National Guard, Air Corps, plans the construction of a 111 x 168 ft. hangar and repair shop, etc., at municipal airport. Estimated cost $250,000 including equipment. C. F. Springall, Archt.

Mass., Brighton—Dorothy Muriel's Food Shops, 1368 Beacon St., awarded contract for a 1 and 2 story bakery and garage at 37 Everett St. Estimated cost $40,000.

Mass., Franklin—R. Vozella, City Mills, Mass., will build a 1 story, 90 x 100 ft. automobile service station and showroom at 42 East Central St. Estimated cost $40,000. Work will be done by separate contracts. Noted Sept. 24.

Mass., Pittsfield—Pittsfield Electric Co., C. F. Merrill, Pearl St., will not construct 3 story service station, garage and office at Pearl St. and Renne Ave. This corrects report in September 24 issue.

Mass., Salem—Donnell & Mudge, Canal St. and Ocean Ave., manufacturers of asbestos shingles, awarded contract for a 2 story factory.

Mass., Waltham—Matthew Sullivan, 1025 Main St., awarded contract for a 1 story garage and repair shop. Estimated cost $40,000.

Mich., Mount Clemens—Copeland Products Inc., awarded contract for the construction of a 1 story, 57 x 120 and 50 x 200 ft. refrigerator factory. Estimated cost $50,000.

Mich., Ypsilanti—Albert Kahn, 1000 Marquette Bldg., Detroit, Archt., will receive bids about Oct. 10 for a 1 story, 160 x 350 ft. factory for the manufacture of automobile parts here for Ford Motor Co., Dearborn, $100,000.

Minn., Minneapolis—City, F. S. Cram, Purch. Agt., 223 City Hall, will soon receive bids for the construction of a 1 story, 66 x 116 ft. warehouse and repair shop at Third St. and Third Ave. S. Estimated cost $35,000. N. W. Elsberg, City Hall, Engr.

Minn., Minneapolis—Lawson & Nelson Sash & Door Co., 173 Glenwood Ave., whose plant was recently destroyed by fire plans to either build a new plant or lease other building. Loss $50,000.

Mo., Windsor—International Shoe Co., W. H. Moulton, Pres., 1501 Washington Ave., St. Louis, will build a shoe factory here. Estimated cost $80,000. Work will be done by local labor.

N. J., Somerville—Owner, c/o P. C. Van Nuys, 1 West Main St., Archt., completed plans for a 2 story, 100 x 200 ft. garage and stores building. Estimated cost $150,000.

N. Y., Albany—Terminal Associates, c/o Sibley & Fetherston, 205 East 42nd St., New York, N. Y., Archts., completed plans for a 2 story, 75 x 140 ft. bus terminal on Broadway here. Estimated cost $50,000. Maturity indefinite.

N. Y., Brooklyn—Brooklyn Union Gas Co., 176 Remsen St., plans a 2 story addition to garage and storage building at Varick and Maspeth Sts. Estimated cost $40,000. Private plans.

N. Y., Long Island City—Queensboro Dairy Co., 42nd St. and 35th Ave., postponed construction of service garage at 41st St. and 35th Ave. $40,000. Maturity November. Noted Sept. 17.

N. Y., New York—Lebanon National Kosher Sausage Factory, J. Altman, Pres., 224 East 6th St., postponed construction of garage and storage building at West Farms Road and 173rd St. R. Shutkind, 147 4th Ave., Archt. Maturity about March. Noted Aug. 27.

N. Y., New York—May Radio & Television Corp., c/o D. W. May, 112 Bleecker St., plans alterations and remodeling of 6 story loft building at 380 Lafayette St., for the manufacture, storage and distribution of radio and television equipment. Estimated cost to exceed $40,000. Maturity indefinite.

N. Y., Syracuse—Bush Haulage Co., 1134 West Belden Ave., plans to reconstruct part of automobile service and garage building recently destroyed by fire. Loss $50,000.

O., Cleveland—City, D. E. Morgan, Mgr., will soon award contract for excavation of a 1 story, 200 x 500 ft. underground exhibition building, hall and garage on Lakeside Ave. Estimated total cost $1,500,000. Herman Kregelius, 504 City Hall, Archt.

O., Girard—Pennsylvania R.R., Broad Street Station, Philadelphia, Pa., postponed construction of engine house here. $500,000. T. J. Skillman, Philadelphia, Ch. Engr. Maturity indefinite Noted Sept. 24.

Pa., Blawnox—Sun Oil Co., W. A. Courtney, Sun Bldg., Philadelphia, Pa., awarded contract for a 1 story, 65 x 100 ft. garage and office building on Freeport Road here.

Pa., Chester—Ford Motor Co. plans reconstruction of assembly plant recently destroyed by fire. Estimated cost to exceed $100,000.

Pa., Donora—Albert Zeffiro, 106 Keuric Ave., completing plans for a 1 story, 44 x 100 ft. garage building at Eighth St. and Meldon Ave. Conrad C. Compton, Donora, Archt.

Pa., Latrobe—St. Vincents Arch Abbey, is having plans prepared for erection of a 3 story, 60 x 150 ft. shop and dormitory building. Estimated cost $150,000. Link, Weber & Bowers, 407 North Craig St., Pittsburgh, Archts.

R. I., Charlestown—State Board of Public Roads, will soon award contract for erection of a 1 story garage at City Mills section. Estimated cost $50,000. Private plans.

R. I., Providence—Cohen Auto Supply Co., 123 Wickendon St., awarded contract for addition and alterations to service station on Wickendon St. Estimated cost $40,000.

R. I., Providence—J. J. Flannegan, 134 Sharon St., plans erection of a 1 story garage at 149 Park St. Estimated cost$ 40,000 to $50,000. W. G. Richars, 49 Westminster St., Archt.

Tex., Fort Sam Houston—A. S. Harrison, Constructing Quartermaster, awarded contract for the construction of a group of buildings including 1 story, 447 x 560 ft. engineering shops, 66 x 260 ft. dope house, 60 x 66 ft. dope storage house, 10 x 50 ft. boiler house, etc. at Duncan Field. $679,000. Noted Sept. 3.

Wash., Port Angeles—Olympic Forest Products Co., San Francisco, Calif., awarded contract for the construction of a storage building here. Estimated cost $40,000 including equipment.

Wis., Kaukauna—Thilmary Pulp & Paper Co., M. A. Werthheimer, Pres., plans a 2 story plant and office building. Estimated cost $40,000. Architect not selected.

Wis., Menasha—Appleton Engraving Co., 348 West Water St., is receiving bids for a 1 story, 65 x 115 ft. plant. Estimated cost $40,000. Lee & Gmeiner, 601 West College Ave., Appleton, Archts.

Ont., Toronto—Hoar Transport, Ltd., 40 Oxford St., plans erection of a 1 and 2 story garage and truck terminal building on Eastern Ave. Estimated cost $100,000. R. H. Bishop, Harbor Bldg., Archt.

Equipment Wanted

Calif., Mare Island—Bureau of Supplies & Accounts, Navy Dept., Washington, D. C., will receive bids until Oct. 13 for a motor-driven backgeared shaper.

D. C., Washington—Board of District Commissioners, District Bldg.—will receive bids until Oct. 16 for one vertical boring and turning mill and one vertical extension bed gap lathe.

Mass., Boston—Standard Valve Mfg. Co., 120 Southampton St.—No. 4 Bardons & Oliver screw machine and No. 20 Bliss power press or equal.

Minn., Minneapolis—Kesler Motor Sales, 1612 Lyndale Ave. N.—complete tools and equipment for automobile repair shop.

O., Cleveland—Board of Education—will receive bids until Oct. 12 for engine lathes, wood turning lathes, drill presses, floor type grinders, oil stone grinders, motor driven, band saws and sanding machines.